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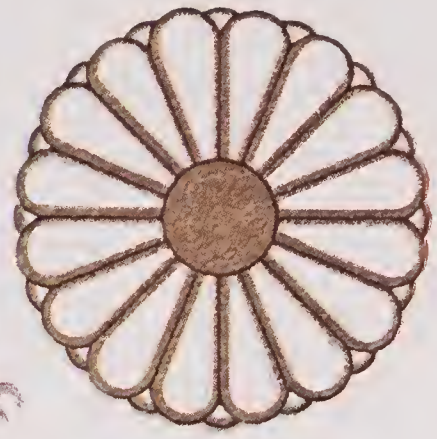

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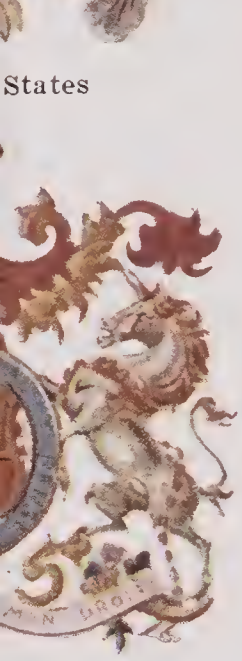

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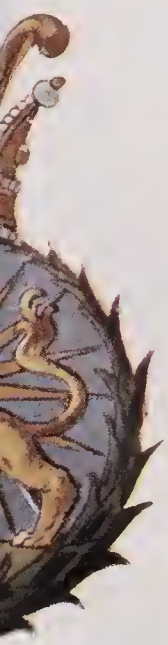

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A Dictionary of Universal Knowledge in eight volumes—Fully illustrated

VOLUME VII

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THE STANDARD AMERICAN ENCYCLOPEDIA

IN EIGHT VOLUMES—FULLY ILLUSTRATED

Volume VII

SALT RIVER—THURINGIA

Salt River, a river in Kentucky, formed of three branches, the Rolling Fork, East Fork, and Beach river. It is in the N. part of the State and joins the Ohio 19 miles S. W. of Louisville. The first and third branches unite about 11 miles N. E. of Elizabethtown. The source of the East Fork, or Salt river proper, is in Boyle county, and its course is N. to Mercer county, turning to the W. in Spencer county, and continuing through Bullitt county in the same direction, uniting with Rolling Fork or Salt river 9 miles to the S. W. of Shepherdsville. The main river flows into the Ohio river at West Point, about 10 miles from the juncture of Rolling and East Forks. It is more than 100 miles long.

Another Salt river is in Northeastern Missouri, formed of three branches or forks, called North, Middle, and South Forks. The North Fork is the main river; its source is in Schuyler county and its course is S. by S. E. until it reaches Monroe county, where it turns toward the E., then traverses Rolls county, and in Pike county flows into the Mississippi 2 miles above the border of Louisiana. The source of Middle Fork is in Macon county, and it flows S., entering Salt river, the main fork, at Florida. The South Fork flows N., intersecting Audrain county, and unites with the Middle Fork 3 miles S. W. of Florida. This Salt river is 200 miles long.

Salt River, an imaginary river up which defeated candidates for office in the United States are said to row.

Salt Sea. See DEAD SEA.

Salts, Smelling, a preparation of carbonate of ammonia with some agreeable scent, as lavender or bergamot, used by ladies as a stimulant and restorative in fits of faintness. The pungent quality of the ammonia supplies the beneficial property of these preparations.

Salt Spring, a spring of water containing a large quantity of common salt. Such springs are very abundant in America, Europe, and other parts of the world. They rise through strata of sandstone and marl, which contain large beds of rock salt. Culinary salt is obtained from them by evaporation.

Saltström, a cataract formed by the tide in the Skjerstad Fjord, on the west coast of Norway.

Salt Tax, a duty imposed by the ancient Romans on salt, which most modern States have also taxed heavily. In India the salt duty is the third source in order of importance of the Indian revenue, or, excluding opium, it is the second. Formerly its amount varied in different localities, now it is uniform over India at two rupees per maund ($1.35 a cwt.). The revenue from it in 1882–1883 was $30,887,905.

Saltus, Edgar Everston, an American novelist; born in New York, June 8, 1858. He was educated in Europe and graduated at the Columbia Law School. He is represented in fiction and miscellany by "Balzac" (1884); "The Philosophy of Disenchantment" (1885); "The Anatomy of Negation" (1886); "After-Dinner Stories" (1886), a translation from Balzac; "Mr. Incoul's Misadventure" (1887); "The Truth about Tristrem Varick" (1888); "Eden" (1888); "A Transaction in Hearts" (1888); "The Pace That Kills" (1889); "A Transient Guest" (1889); "Love and Lore" (1890); "Mary Magdalen" (1891); "Imperial Purple" (1892); "Madame Sapphira" (1893); "Enthralled" (1894); "When Dreams Come True" (1895); etc.

Saltus, Francis Saltus, an American poet, brother of Edgar; born in 1849. He was of the modern school of poets. He published a book of poems, "Honey and Gall," in 1873; and another collection, bearing the title "The Bayadere and Other Sonnets," appeared in 1894. He died in 1889.

Saltykov, Michail Yevgráfovich, pseudonym N. SHESHEDRIN, a noted Russian satirist; born Jan. 27, 1826. The first work to give him celebrity throughout Russia was "Sketches from the Provinces" (1856); it was followed by "Satires in Prose" and "Innocent Stories" (1863); "Signs of the Times" (1869); "Male and Female Pompadours" (1876); "Across the Frontier"; "An Idyll of Today" (1884–1886); "Life's Pettinesses" (1887). The Russian press laws compelled the author to use an allegorical style, which makes his meaning unintelligible to foreigners. He died in St. Petersburg, May 12, 1889.

Saltwort, the *Salsola,* a genus of plants of the natural order *Chenopodiaccæ,* having hermaphrodite flowers, with five-parted perianth and a transverse appendage at the base of each of its segments, five stamens and two styles, the seed with a simple integument. The species are numerous, mostly natives of salt marshes and sea-shores, widely diffused. One only, the prickly saltwort (*S. kali*), is found in Great Britain. The plant is annual, with prostrate much-branched stems, awl-shaped spine-pointed leaves, and axillary solitary greenish flowers. It was formerly collected in considerable quantities on the W. shores of Great Britain, to be burned for the sake of the soda which it thus yields. *S. sativa* is the chief BARILLA (*q. v.*) plant of the S. of Spain.

Salus, the Roman goddess of health, public prosperity, etc.

Salutation

Salutation, a sign which custom has rendered common, for expressing to others, in our intercourse with them, our esteem, love, submission, or good will. Greeting (in German, *gruss, grüssen*), is derived from the Low German *gröten*, to make great: thus "God greet you," means, "God make you great — bless you." Salutation sometimes consists of certain gestures. Sometimes an express assurance or wish is added to these mute signs of feeling. The difference in the forms of salutation often extends so far that one nation considers that a mark of rudeness which another esteems a mark of civility. In most German countries it is an act of politeness to kiss the hands of ladies; but in Italy this is regarded as a mark of familiarity which is permitted only to the nearest relatives. On the contrary the Russian ladies allow not only the hand to be kissed, but even the forehead, and would consider themselves insulted by the omission of this ceremony. Instead of the customary salutation in the Protestant countries of Germany, "Good morning," "Your servant," etc., the German Catholic salutes in the manner prescribed by Pope Benedict XIII. (1728), "Praised be Jesus Christ"; to which the answer is, "Forever, amen!" The miner's salutation is, "Good luck to you" (*Glück auf*).

The military salutations which were introduced among the Germans in the beginning of the 16th century consist in touching the hat or cap, lowering the standards and the sword, or raising the musket. Vessels, when meeting, salute each other by a discharge of cannon, by striking the flag, or by the cheers of the sailors, etc. We express our esteem for persons of distinction by bowing and uncovering our heads; the Russian throws himself on the ground before his master, clasps his knees, and kisses them. The Pole bows to the ground, and the Bohemian kisses at least the gown of any one for whom he wishes to express his profound respect. Mutual contact is regarded among almost all nations as the expression of friendly sentiments. The pressing of hands, embraces, and kisses are among other nations also, as well as those of Europe, marks of esteem and love. Some nations, in saluting, touch other parts of the body. The Laplanders, for instance, press their noses firmly together. In one of the larger Cyclades, persons reciprocally moisten each other's hair; and the Franks are said to have pulled out a hair and presented it to the person saluted. The Turk crosses his hands, places them upon his breast, and bows.

The salutation of the Hindus in Bengal consists in touching the forehead with the right hand, and bending the head forward. They first place the right hand on the breast with a profound inclination, then touch the ground, and finally the forehead with the same hand. At the same time they call themselves the most humble slave of him whom they salute. The inhabitants of the Manilas bend the body profoundly, place their hands upon their cheeks, raise one leg, and bend the knee. The inhabitants of Lamurzee, in the Pelew Islands, seize the hand, or even the foot of the person whom they wish to salute, and rub their face with it. In the island of Sumatra the saluting person bows, begs the left foot of him whom he addresses, kneels on the ground, and applies this foot to his crown, forehead, breast and knee; finally he touches the ground with his head and remains for some moments stretched out on his belly.

The salutations in the East generally bear the stamp of a slavish mind. The very ancient custom of throwing one's self on the ground before persons of distinction, and repeatedly kissing their feet, has continued to the present time. At an entertainment in Persia the host goes a considerable distance to meet his guests, bids them welcome with the most respectful compliments, then returns hastily to the door of his house, and waits their arrival to repeat the same demonstrations of respect. In China, if two persons meet on horseback, the inferior in rank dismounts from his horse before the superior, and remains standing till he has passed. Some salutations are also peculiar to men, and others to women. When acquaintances meet, they join their hands on their breasts or above their heads, bend their head a little, and say *Tsin tsin*, a compliment without any particular signification. In saluting persons to whom they owe more respect, they clap their hands, then raise them, and finally let them sink down to the ground. Friends who meet after a long separation fall repeatedly on their knees and bend their heads to the ground, exclaiming at the same time, *Na fo?* (Has all passed happily?) or, *Yung fo* (Happiness is painted upon thy countenance). Women salute each other with the words *Van fo* (May all happiness be with you); but they are not allowed to salute men. Children fall on their knees before their parents, and servants before their master or mistress.

In Japan the inferior of two persons, saluting, takes off his sandals, puts his right hand into his left sleeve, permits his hands, thus crossed, to sink slowly on his knee, passes the other person with short, measured steps, and a rocking motion of the body, and exclaims, with fearful countenance, *Augh! augh!* (Do not hurt me!) In Siam the inferior throws himself on the ground before his superior. The latter then sends one of his attendants, who are very numerous in the cases of persons of distinction, to examine whether he has eaten or carries with him anything of an offensive smell. If this is the case he receives a

Salutation

kick from the superior and is compelled to retire immediately; if otherwise, the servant lifts him up. Women, even when advanced in age, are saluted with the names of the most beautiful and most precious objects, but not without the additional word "young"; as "young diamond," "young gold," "young heaven," "young flower," etc. If friends wish to express their mutual attachment, they scratch their hand slightly and reciprocally suck a drop of blood from the wound. In Ceylon, when persons salute, they raise the palm of the hand to the forehead and make a low bow. Before a superior they throw themselves on the ground, continually repeating his name and dignity, while the superior very gravely passes on and hardly deigns to utter a word of reply. The greeting of the common Arabian is *Salâ aleikum* (Peace be with you), a salutation which has been long in use among the Jews. At the same time he places his left hand upon his breast, as a sign that this wish comes from his heart. The reply is, *Aleikum essâlam* (With you be peace). But Arabians of distinction embrace each other two or three times, kiss each other's cheeks, and inquire two or three times after each other's health; at the same time each kisses his own hand.

The Arabians of the desert shake hands six or eight times. In Yemen, persons of distinction after a long refusal allow their fingers to be kissed. The Abyssinians and other nations fall on their knees and kiss the ground. Several Negro nations take each other's hands and pull the fingers till they crack. The Negroes of Sierra Leone bend the right elbow, so that the hand touches the mouth; the person saluted does the same; they then put their thumb and fore-finger together, and withdraw them slowly. Other Negroes snap their fingers in meeting each other, pull the comb out of their hair, and replace it. In Lower Guinea, the saluting person seizes the fingers of the saluted, brings them into a particular position, presses them, cracks them hastily, calling, *Akkio! akkio!* (Thy servant! thy servant).

On the gold coast of Upper Guinea, friends embrace each other, join the forefingers of their right hands till they crack, bend their heads, repeating *Auzi! auzi!* (Good day! good day!). Persons of distinction, after cracking the fingers, exclaim, *Bere! bere!* (Peace! peace!). If the Mandingoes salute a female, they take her hand, raise it to their nose, and smell it twice. Mr. Snellgrave, an Englishman, with his companions, was saluted by a messenger of the King of Dahomey, attended by 500 Negro soldiers, in a very novel manner. The officers of the corps approached their English guests with drawn swords, which they brandished over their heads with curious gesticulations and motions. They then placed their swords on their bodies, and, after a repetition of these ceremonies, the messenger presented them his hand and drank to their health. In Morocco, foreigners are saluted by the Moors, on horseback, in a manner which may well startle those not accustomed to it. The Moor rides full speed toward the stranger as if about to run him down; he then suddenly stops and discharges his pistol over the head of the person. Persons of equal rank salute each other nearly in the European way. They shake hands and kiss each other's face and beard, particularly if they are friends.

The Egyptians extend their hands, place them on their breast, and bend their heads. The greatest act of politeness is to kiss their own hand, and afterward place it on their heads. They only kiss the hand of men of distinction, not of women. Inferior officers hold the stirrup of their superiors, mounting on horseback. In the divan the inferior takes off the slipper of the superior, places it by his side, and receives the same salutation from the latter. In other countries of Africa people take off their clothes, fall on their knees, bend their heads to the ground, and cover their heads and shoulders with sand. The Ethiopians seize the right hand of him for whom they wish to show respect, and raise it to their mouth. They even take his sash and tie it round their waist, so that he remains for some time half naked.

The salutations between the different tribes in the Northwest of America are very ceremonious. If two hordes of these Indians meet, they stop at the distance of 20 or 30 steps, throw themselves on the ground, and remain for some moments in this position. The two eldest of each party then advance and relate very circumstantially the dangers they have encountered. As soon as they have finished their relations they all begin to sigh. These sighs are finally changed to a horrible yell, in which the young girls, particularly, endeavor to surpass the others of the tribe. With these affecting manifestations of sympathy both parties approach, but each sex separately. Tobacco pipes are handed about, and their affliction is soon changed into merriment.

The manner in which the inhabitants of South America salute each other is short. Their address is *Ama re ka!* (Thou!); and the answer, *A!* (Yes!). The former savage of Louisiana Territory, when saluting a person of distinction, begins a loud howl. In the hut he repeats the salutation, holding his hands above his head, and howling three times. He returns thanks with another howl, when the superior invites him, with a low sigh, to sit down. In Otaheite, and particularly in the Society and Friendly Islands persons touch the ends of each other's noses. This salutation is returned by each rubbing the hand of the other on

his own nose and mouth. The Otaheitan presents a person whom he chooses for a friend, sometimes a part of his dress, sometimes with the whole. The inhabitants of New Guinea cover their heads with leaves. This action is also regarded as a sign of peace.

Salutes, Military. All officers salute on meeting and on making or receiving official reports. Military courtesy requires the junior to salute first or when the salute is introductory to a report made at a military ceremony or formation to the representative of a eonmon superior, as for example to the adjutant or officer of the day, the officer making the report, whatever his rank may be, is required to salute first; the officer to whom the report is made will aeknowledge by saluting that he has received and understood it. When under arms the salute is made with the sword or saber if drawn, otherwise with the hand, and a mounted offieer always dismounts before addressing a superior who is not mounted. On offieial occasions officers, when indoors and under arms, do not uncover, but salute with the sword, if drawn, and otherwise with the hand. If not under arms they uncover and stand at attention, but do not salute except when making or receiving a report.

When an enlisted man without arms passes an offieer he salutes with the hand farthest from the offieer, but if mounted he salutes with the right hand, and offieers are to be saluted whether in uniform or not. When armed with the saber and out of ranks an enlisted man salutes with the saber, if drawn, but otherwise with the hand. If on foot and armed with a rifle or carbine he salutes with his weapon. A mounted soldier dismounts before addressing an officer not mounted. An enlisted man, if seated, rises on the approach of an offieer, faees him and salutes; if standing he faees the officer for the same purpose. If both remain in the same place or on the same ground such eompliments need not be repeated, and soldiers, if at work, do not eease work to salute an offieer unless addressed by him. Before addressing an officer an enlisted man salutes as prescribed, and he also makes the same salute after receiving a reply. Indoors and unarmed an enlisted man uneovers and stands at attention on the approaeh of an offieer. He does not salute unless he addresses or is addressed by the officer. If armed he salutes as though outdoors.

When an offieer enters a room where there are soldiers the word "attention" is given by someone who perceives him, when all rise and remain standing in the position of soldier till the officer leaves the room; but soldiers at meals do not rise. Offieers are required to at all times acknowledge the courtesies of enlisted men by returning salutes given, and when several officers in company are saluted, all who are entitled to the salute return it.

Salutes With Cannon. Salute to the Union. This is one gun for each State, and is commemorative of the Declaration of Independence. It is fired at noon of the Fourth of July at every military post and on board commissioned naval vessels belonging to the United States. The National Salute, 21 guns. This is the salute for the National flag, the President of the United States, presidents of foreign republics or sovereigns of foreign States visiting the United States. Vice-President of the United States, American and foreign ambassadors, 19 guns. The president of the Senate, speaker of the House of Representatives, members of the eabinet, the chief-justice, a eongressional committee, governors within their respective States or Territories, viceroy or governor-general of provinces belonging to foreign States, general of the army, admiral of the navy, and same ranks in foreign armies and navies, 17 guns. Ameriean or foreign envoys, or ministers plenipotentiary, assistant Seeretaries of the Navy or War, lieutenant-general, or a major-general eommanding the army, and corresponding ranks in the navy and foreign armies and navies, 15 guns. Ministers-resident aceredited to the United States, major-general, rear-admiral, and corresponding ranks of foreign armies and navies, 13 guns. Chargés d'affaires, brigadier-general, eommodore, and corresponding ranks in foreign armies and navies, 11 guns. Consuls-general aceredited to the United States, 9 guns.

Salutes are only fired between sunrise and sunset, and not on Sundays, except in international courtesies. The national colors are always displayed at the time of saluting. The salute to the flag is the only salute which is returned, and this must be done within 24 hours. United States vessels do not return the salute to the flag in United States waters if there is any fort or battery there to do it. Nor do United States vessels salute United States forts or posts.

If there are several batteries or forts within sight or 6 miles of eaeh other, one of them is designated as the saluting fort, and returns all salutes of foreign men-of-war. In New York, Castle William, on Governor's Island, is the saluting fort.

Salut Public, Comite de (French, Committee of Public Safety), the term applied to a number of members of the National Convention during the Reign of Terror, 1793–1794, who acted as the dictators of France. The eommittee arose out of that section of the eonvention called the "Mountain," which had gained the vietory over the Girondist party; and at length its power came to be

concentrated in three of its members—Robespierre, the real chief, though half concealed from view, Couthon, and St. Just. Among these men there was perfect equanimity down to the moment of their fall; and there is reason to believe that they had resolved to perpetuate their power by establishing a supreme council of three consuls, in which Robespierre would have had the perpetual presidency, with the departments of Justice, Exterior, and Finance; Couthon that of the Interior, and St. Just the War Department. The career of this sanguinary tribunal was brought to a termination by some of their former associates impeaching its members before the convention; and a reaction having taken place in the public mind, Robespierre, Couthon, and St. Just were executed on the 9th Thermidor (July 28, 1794).

Saluzzo, a city of Northern Italy, at the foot of the Alps, 42 miles S. by W. of Turin. It contains a semi-Gothic cathedral, built in 1480, with the tombs of the old marquises of Saluzzo, their old castle (now a prison), and the ruined abbey of Staffarda (1131–1737). Silvio Pellico was born here. It manufactures silk fabrics, leather, and hats. Pop. 9,716.

Salvador, or **San Salvador,** a republic in Central America; on the coast of the Pacific; bounded by Honduras on the N. and E., by Guatemala on the N. W.; area, 7,225 square miles; pop. (1906) 1,116,253, mostly Spanish-speaking Indians and half-breeds. A range of volcanic peaks, varying in height from 4,000 to 9,000 feet, runs through the center of the country, dividing an interior valley from the lowlands on the coast. The largest river is the Lempe, which is only navigable in parts. The soil is remarkably fertile. The most important crop is indigo, which is of excellent quality. Maize, sugar, coffee, tobacco, cotton, etc., also thrive well. Cattle-breeding is carried on, but not extensively. The manufactures are unimportant. The chief exports are coffee, indigo, silver, raw sugar, balsam of Peru, leather, etc. They are of the annual value of about $7,500,000. The established religion is Roman Catholicism. The government is carried on by a president and four ministers. There is a congress of 70 deputies elected by universal suffrage. The inhabitants had long the reputation of being the most industrious in Central America, and the State, in proportion to its size, is still the most densely peopled. Salvador remained under Spanish rule till 1821, when it asserted its independence and joined the Mexican Confederation. In 1823, however, it seceded from the confederation and subsequently formed part of the Republic of Central America. In 1853 it became an independent republic. Its progress has been much hindered by internal dissensions, revolutions and counter-revolutions following each other without end. The capital is San Salvador.

Salvadora, a genus of plants, type of a natural order (*Salvadoraceæ*) of monopetalous dicotyledons, allied to *Olaceæ* and *Jasminaceæ*. They have stems with slightly swollen joints, opposite entire leaves, and loose branching panicles of small flowers. *S. persica* is supposed to be the mustard tree of Scripture, which has very small seeds and grows into a tree. Its fruit is succulent and tastes like garden cress. The bark of the root is acrid.

Salvage, the act of saving a ship or goods from extraordinary danger, as from fire, the sea, an enemy, pirates, or the like. In commercial and maritime law: (1) A payment or compensation to which those persons are entitled who have by their voluntary efforts saved ships or goods from extraordinary danger, as from fire, the sea, an enemy, pirates, or the like. The amount of salvage to be paid is generally agreed on between the salvors and the owners of the property salved; but if they cannot agree, the sum to be paid, and the proportions in which it shall be paid, are determined by the Admiralty Court. The crew of a ship are not entitled to any salvage for any extraordinary efforts they may make in saving their own vessel. (2) The property saved from extraordinary danger by the voluntary efforts of the salvors.

Salvage Corps, a corps or body of men attached to a fire department or maintained by fire insurance companies, whose duties are the salvage of property from fire, and the care of that which is salved.

Salvage Loss, the difference between the amount of salvage, after deducting the charges and the original value of the property.

Salvation, the act of saving; rescue or preservation from danger, great calamity, or total destruction; as, marrying money was his salvation. In theology, the deliverance wrought out by Christ for mankind, saving them from the consequences of their sins. This last is the sense in which it is commonly used in the New Testament, as by the Apostle Paul, when he says, "How shall we escape if we neglect so great salvation?"

Salvation Army, an organization, formed on the model of an army, for evangelizing the masses in large cities; originally known as the Christian Mission; founded at Mile End, London, by the Rev. William Booth, July 5, 1865. From 1872 to the present the movement has spread all over the globe, and while the methods of the "Army" have been decried and doubts cast on the stability of their conversions, it is nevertheless a fact that they reach people with whom the evangelistic churches do not come in contact. The members, both male

and female, wear a uniform, and use a peculiar nomenclature.

In 1902 there were 15,300 officers, composed of men and women whose lives are entirely given to the work; 7,296 corps or societies operating in 47 countries and colonies in 34 languages. There are some 2,500,000 meetings held annually out doors and in. There are 15,850 brass bandsmen and 38,871 unpaid local officers, who support themselves and devote their spare time to the work. The Social Relief Institutions for the poor number 544 and are to be found in nearly all the great cities of the world, caring daily for about 18,000 persons. The Rescue Homes for Fallen Women number about 100, about 5,000 girls passing through them annually, and 80 per cent. of these being permanently restored to lives of virtue and usefulness. The number of periodicals printed or published is 55, with a combined weekly circulation of over 1,000,000. The annual rental roll is over $1,000,000. The amount of property owned by this organization exceeds $4,000,000, and the annual income is more than $5,000,000. The United States Division of the Salvation Army has 2,341 officers, 692 corps or societies, 27 slum posts, 18 rescue homes, with accommodations for 448 fallen women; 102 food and shelter depots, furnishing 27,000 meals monthly, and providing nightly beds for 6,000 of the homeless poor; 6 working-women's hotels, with accommodations for 250 women; 14 salvage brigades for collecting household waste, together with 6 wood and coal yards, furnishing temporary work for 650 unemployed men; 3 farm colonies, and 2 children's homes. Christmas dinners were supplied to 150,000 persons in the great cities of the United States in 1901, 25,000 persons being fed in Greater New York, where the Madison Square Garden was engaged for the occasion, and a unique spectacle presented. The organization also has in the United States cavalry brigades, out-riders' circuits, maternity homes, labor bureaus, women's shelters, and an inquiry department, which looks up missing friends and relatives. William Booth is the general and commander-in-chief of the forces throughout the world. His headquarters are in London. The United States commanders are Commander and Consul Booth-Tucker. See VOLUNTEERS OF AMERICA.

Salve, that which saves, mitigates, relieves, or preserves; a help; a remedy; an aid; an antidote; as, heavy damages proved a salve to his dishonor. Also an adhesive composition; a substance applied to heal, mollify, or relieve wounds or sores; an unguent; an ointment; a plaster.

Salve, Regina, in the Roman Catholic Church, the first words of a prayer to the Virgin Mary, hence used for the prayer itself. In the Divine Office it is recited at the end of Lauds and Compline, and it is much used in private devotion. Also any musical setting of the prayer described above.

Salvelini, in ichthyology, a group or sub-genus of *Salmo*, with teeth on the head of the vomer only. Among the chief species are *S. umbla* (the ombre chevalier of the Swiss lakes), *S. alpinus* (the northern charr), *S. perissi* (the torgoch), *S. grayi* (the freshwater herring), *S. hucho* (the huchen or the Danube), *S. arcturus* (the most N. species, from lat. 82° N.), and *S. fontinalis* (the brook trout of the United States).

Salvia, sage; the typical genus of the *Salvidæ*. Calyx two-lipped; stamens two, forked. Undershrubs or herbs, widely distributed. Known species about 400, many of them very showy, flowering plants, cultivated in gardens or in greenhouses. *S. officinalis*, of which there are many varieties, is the common sage, a well-known culinary herb (see SAGE). It is a feeble tonic and astringent and an efficient aromatic. *S. grandiflora* is also culinary. The galls of *S. pomifera* are eaten in Candia, as are the stalks of *S. moorcroftiana* in the Himalayas. The root is used in cough, the seeds as an emetic, and the leaves as a medicine in guinea-worm and itch, or as a poultice to wounds. The seeds of *S. plebeia* and *S. pumila*, also Indian species, are given in gonorrhœa, etc.

Salvini, Tommaso, an Italian tragedian; born in Milan, Jan. 1, 1830. His father and mother were both actors; was trained under Modena, a distinguished player; and became well known as a member of Ristori's company. In 1849 he fought with distinction in the revolutionary war; and returning to the stage played with eminent success as Œdipus in a play written for Salvini by Nicolini, and as Saul in Alfieri's drama. In Paris he played in these, in Racine's plays, and as Shakespeare's Othello — the part with which he is identified in the minds of English playgoers. He scored successes in Brussels and Madrid, and visited the United States in 1874, England in 1875, with as great *éclat*. But after another visit to the United States in 1881, and to Great Britain in 1884, he retired from the stage to enjoy a life of learned leisure in his villa near Florence. Among his most striking parts were — besides Othello — Hamlet, Macbeth, and Lear. His son Alexander adopted his father's career, and inherited much of his talent.

Salvinia, a genus of the order of plants formerly called *Rhizocarpeæ* or pepperworts, now known as the heterosporous ferns. They are "ferns" because, among other reasons, the development of the embryo is similar to that process in the common ferns,

and "Heterosporous" because the sporophyte bears two kinds of spores instead of one. To understand these plants it is necessary to know the structure of ferns. The order includes two families, the *Salviniaceæ* and the *Marsiliaceæ*. The former consists of two genera, *Salvinia* and *Azolla*, the latter also of two genera, *Marsilia* and *Pilularia*. The spore-bearing generation of *Salvinia* is a plant that floats on the surface of water. The stem bears on its upper surface four rows of aërial leaves, and on its under surface two rows of submerged aquatic leaves, which have the outward form and functions of roots; there are no true roots at all. The stem of *Marsilia* creeps along the surface of marshy land or on the bottom below the water. The upper surface of the stem bears two rows of leaves with long stalks, the under surface bears roots. *Pilularia* has peculiar narrow leaves. In *Salvinia* the sori or groups of sporangia are placed upon the aquatic leaves near the insertion, whence the old name rhizocarpeæ. The coverings or indusia form small berry-like objects. In *Marsilia* the sori are borne on fertile leaves which branch from infertile leaves just above their insertion. The fertile leaves are folded in like pea-pods, and each of them encloses several sori. The sori of *Pilularia* are similar, but globular. The sori of *Salvinia* and of *Azolla* are of two kinds. Some contain numerous long-stalked microsporangia with female spores; others contain fewer (in *Azolla* only one) short-stalked female macrosporangia with female spores. In *Marsilia* and *Pilularia* the macrosporangia and microsporangia occur within the same sori. The microspores develop into rudimentary filamentous male prothallia. The antherozoids are formed in two cells at the apex of the filament, which represent the antheridium. The macrospores develop into female prothallia which never grow more than to project a little from the spores; they bear archegonia. The oösphere within an archegonium is fertilized by an antherozoid, and produces an embryo. The heterosporous ferns are interesting as showing a stage in that reduction of the prothallium as an independent plant which reaches its climax in the seed plants. See FERN.

Sal Volatile, carbonate of ammonia. The name is also applied to a spirituous solution of carbonate of ammonia flavored with aromatics.

Salwin, Salween, or **Salwen,** a river of Burma with a general N. and S. course parallel to the Irrawady, rising in Southwestern China, and falling into the Indian Ocean (Gulf of Martaban), the towns of Martaban, Moulmein, and Amherst being at or near its mouth. The river course is interrupted by rocks and rapids, but vessels of the largest size can reach Moulmein. Vast quantities of teak are annually floated down the Salwin and shipped at Moulmein for export. The area of the Salwin basin is 62,700 square miles; the river is 800 miles in length, and from 1 to 4 miles in breadth.

Salzbrunn, a group of three villages (New, Lower, and Upper Salzbrunn) in Prussian Silesia; 40 miles S. W. of Breslau; have eight mineral springs, which attract nearly 4,000 visitors in the season. The water is alkalo-saline; about 1,100,000 bottles are exported every year. There are glass and porcelain factories, yarn-spinning works, brick works, and coal mines.

Salzburg, a city of Austria, capital of the duchy (or province) of Salzburg, picturesquely situated on both banks of the rapid Salza, which is here hemmed in between two isolated hills, 63 miles S. E. of Munich. It is partly walled, and has several handsome squares and streets, ornamental grounds, park, and river promenades. The principal edifices are the cathedral (1614–1628) built in imitation of St. Peter's, Rome, several other churches; the archbishop's palace (now belonging to the town), imperial palace, exchange, museum, and several benevolent institutions. It was the birthplace of Mozart, and there is a bronze statue of the composer by Schwanthaler. There is a theological college, and other high-class educational institutions, extensive libraries, etc. The manufactures are varied, but not individually of importance. The environs of Salzburg furnish charming scenery. The town was the see of a bishop in the 7th century, which in 798 was raised to an archbishopric. The Bishops of Salzburg were princes of the German empire, and held the position of sovereigns over the archbishopric till it was secularized in 1802. Pop. 33,067. The duchy or crown-land of Salzburg, area 2,767 square miles, is a rugged mountainous country, intersected by numerous valleys, chiefly pastoral, but in many of them much corn and fruit are raised. Wood is abundant, and the minerals, which are very valuable, include gold, silver, lead, copper, cobalt, iron, salt, and marble. Pop. (1901) 192,763.

Salzkammergut, called the Austrian Switzerland, one of the most picturesque districts of Europe; between the Austrian crown-land of Salzburg on the W. and Styria on the E.; area, about 230 square miles; pop. 17,500. The scenery combines in rare beauty the features of valley, mountain, and lake. The highest peak, the Dachstein, reaches an altitude of 9,830 feet. But the district derives its principal attraction from its lakes, the most famous of which are Hallstatt, Traun or Gmunden, Atter, St. Wolfgang, Aber, Mond, and Zell. It derives its name of "Saltexchequer Property" from its salt springs and mines, which

yield some 33,000 tons of salt annually. The chief seats of the salt works are Ischl, Hallstatt, and Ebensee. Little or no agriculture is carried on; the inhabitants not engaged in the salt industry are employed in cattle breeding and in the timber trade.

Samar, the third largest of the Philippine Islands; S. E. of the E. part of the island of Luzon, from which it is separated by the Strait of San Bernardino; and the extreme E. of the Visaya group. On the S. W. it is separated from the island of Leyte by the Strait of San Juanico. The W. coast is bounded by the Western Sea, and the E. coast by the Pacific Ocean. The island is mainly mountainous, although there are many fine valleys under cultivation. Samar extends 156 miles from N. W. to S. E., 75 miles from the E. to W., and has an area with adjacent islands of 5,488 square miles; pop. (1903) 266,237. In the mountains are about 10,000 native refugees who live an independent and almost savage life. The products of the island are such as are found in all the archipelago. There are many fine kinds of wood, numerous varieties of wild fruits, various kinds of bamboo, roots suitable for food, rattan, game, and fish. Besides cocoanuts there is a large production of oil, rice and hemp. Among the medicinal plants of the island the most famous is the seed called "isigud" or "the fruit of San Ignacio." It is claimed to be a strong remedy against cholera. On Sept. 28, 1901, a large body of insurgents surprised Co. C, 9th United States Infantry, while its members were at breakfast, and killed 48. The remaining 24 members, of whom 11 were wounded, escaped to Basey. On receiving the news of this massacre, General Hughes, commanding in Samar, immediately organized a large force to pursue the insurgents. On Nov. 7, 1901, the command of Maj. L. W. T. Waller, of the United States Marine Corps, captured the rebel stronghold at Sojoton, near Basey, killing 30 of the enemy and taking 40 bamboo cannon.

Samara, a superior two or more celled fruit, each cell being dry, indehiscent, few-seeded, and having its pericarp extended into a winged expansion. Each cell of the samara is, in fact, an achænium, with a winged margin. Examples of the samara occur in the so-called sycamore, the ash, and the elm.

Samara, a town of Russia, capital of the province of same name; 550 miles E. S. E. of Moscow, at the confluence of the Samara with the Volga. It has manufactures of leather and soap, and is now one of the most important commercial centers on the Volga, carrying on a large trade in corn, meal, salt, linen, wool, fish, and caviare. Three markets are held annually. Pop. (1908) 89,999. The province lies on the left bank of the Volga, and has an area of 58,321 square miles. A great part is flat and fertile, but is at present little cultivated. There is little wood. Wheat and other kinds of grain are the chief products. There are a considerable number of Swiss and German colonists here, also Nogai Tartars, Bashkirs, and Kirghis. In 1899 Samara was afflicted with a great plague and famine. The Russian Red Cross Society was compelled to provide food for 100,000 men, women and children. Pop. (1898) 3,428,200.

Samarang, a seaport of Java; 255 miles E. of Batavia, the principal port for the trade of Middle Java. Since 1873 it has been connected with Jokjokarta and Surabaya by railway. The European quarters have all the appearance of a typical Dutch town. The more important buildings are a military hospital (550 beds), the city hall (1854–1864), and Christian churches and schools. A fort and a coast battery provide defense for the town. The river is silted up at its mouth; but a canal, constructed in 1879, serves as a harbor. The roadstead is exposed during the W. monsoon. Pop. (1901) 89,286.

Samarcand, a city of Turkestan; in the valley of the Zerafshan; about 4 miles S. of that river, and among the W. spurs of the Tian-Shan Mountains; 130 miles E. by S. of Bokhara and 150 miles N. by E. of Balkh in Afghanistan. It is the ancient Marcanda, the capital of Sogdiana, which was taken and destroyed by Alexander the Great. It was again captured in A. D. 712 by the Arabs, who supplanted the Græco-Bactrian civilization, of which it was the center, by the creed and customs of Islam. Ever since that time it has been a sacred city in the eyes of the Moslems, especially after the conqueror Timur made it the capital of his kingdom in the 14th century. It had, however, suffered terribly from Genghis Khan, who took it (1219) and destroyed three-fourths of its 500,000 inhabitants. In Timur's time it had a population of 150,000. Its best and handsomest buildings, as the Ulug-beg *madrasa* or college, the tomb of Timur, the tombs of his wives, the gigantic stone he used as a throne from which to dispense justice, and his audience hall, date from the reign of the great conqueror or his immediate successors. The Ulug-beg, the graves of Timur and his wives, as well as the tomb of one of the Prophet's companions, and two other colleges, the Tilla-Kari and Shir-dar, both dating from the beginning of the 17th century, are magnificent structures, grandly decorated with arabesques, enamelled tiles of different colors, marble pavements, inscriptions in gold, and similar rich ornamentation. In the 15th century Samarcand was renowned as a school of astronomy and

mathematics. After the decay of Timur's empire the city had a checkered history, figuring in most of the wars that raged in that region till at last it fell into the hands of the emirs of Bokhara, from whom it was taken by the Russians in 1868. They established themselves in the citadel, built on a steep hill 4 miles in circuit, and laid out a new town, with broad and handsome streets, to the W. of it. On the other side of the citadel is the old city, walled, with dark and narrow streets and dirty houses. The ruins of still more ancient Samarcands extend for 3 miles or more to the W. and N. of both the Russian and the native town. The people carry on gardening, their gardens being irrigated by water drawn off from the Zerafshan, and the manufacture of textiles, harness, gold and silver wares, leather, pottery, boots, etc., and conduct a brisk trade in cotton, silk, fruits, wheat, rice, salt, and horses. Pop. (1900) 58,194.

Samaria, a city and country of Palestine; situated toward the N. of Judea. Samaria was the country in which the 10 revolted tribes raised their independent state and formed the kingdom properly denominated Israel, in contradistinction to that of Judah, embracing the two tribes of Judah and Benjamin, from which the other 10 had seceded when, refusing the authority of Rehoboam, they established a dynasty of their own, at the head of which they placed Jeroboam, the first king of the nation of Israel. So deadly was the animosity and so implacable the hatred that existed between these two nations of Jews, that, from the time of their severance to the destruction of their capital and the captivity of Israel, an almost perpetual state of warfare existed between Judah and Israel; indeed, so intensely did the former hate the latter, that the term of Samaritan was one of the bitterest contempt and reproach that could be applied to any one. It was the consciousness of this fact, though it had long outlived the existence of the nation, that made the woman at the well marvel when Jesus asked her to draw him some water. The antipathy borne by the people of Judah for those of Israel or Samaria was not only political, but religious, and they hated them not alone for the difference of their institutions, but more for the difference that existed in the form of worship adopted by the Samaritans. These theological dissensions were, however, in time greatly modified by the return of the Samaritans to the ancient form of worship, and by the erection of a temple in the capital that professed to be a model of the great fabric completed by Solomon in Jerusalem, an event that was celebrated soon after the passage of Alexander the Great through the land of Syria. The city of Samaria, and capital of the kingdom, was situated on a hill, Mount Sameron, was founded by Omri, and from that time till its overthrow by the Assyrians was the residence of all the Kings of Israel. It was subsequently rebuilt by Herod, who called it Sebaste (a Greek word signifying Augustus), in honor of Augustus Cæsar.

Samaritan Pentateuch, a recension of the Hebrew text of the Pentateuch, in use with the Samaritans, and accepted by them as canonical to the exclusion of the other Old Testament writings. That such a recension had once existed had always been known from certain allusions in Origen, Jerome, and Eusebius, and also in the Talmud; but Julius Scaliger was the first modern scholar to suggest that it might still be recoverable, and to point out its possible importance if obtained. Early in the 17th century the famous traveler Pietro della Valle succeeded after much inquiry in procuring at Damascus a copy not only of the original of this Pentateuch of the Samaritans, but also of the ancient translation, or Targum, of this in the Samaritan dialect; both documents passed in 1623 into the hands of the Oratorians in Paris, and were published in 1631 in the Paris Polyglott by J. Marinus. In his "Exercitationes Ecclesiasticæ," with which Morinus accompanied the Pentateuch of the Samaritans, he placed it far above the received Hebrew text, a view which had a polemical bearing on current theological discussions between Protestants and Catholics about the "rule of faith," and led accordingly to prolonged controversy, the principal disputant on the Protestant side being the Zurich theologian, J. H. Hottinger. Both the Samaritan Pentateuch and the Samaritan Targum of Morinus were afterward printed by Brian Walton in the London Polyglott (1657), with a collation of the various readings of the Masoretic and Samaritan Hebrew texts. Through Ussher and others a number of additional Samaritan codices were brought to Europe in the course of the 17th century, so that Kennicott was able to use for his Hebrew Bible 16 MSS. more or less complete.

The first to arrange the variants in a systematic way, and to determine with any scientific accuracy the kind and amount of authority that can be claimed for the Samaritan recension of the Pentateuch was Gesenius. Its various readings are most of them of a quite trifling nature and do not at all affect the sense, representing merely a different fashion in spelling or grammatical expression; and perhaps the only one that would seem to indicate an essentially different point of view from that of the Masoretic text is the substitution of Gerizim for Ebal in Deut. xxvii: 4. As is well known, the Samaritan Pentateuch varies from the received text in the figures it gives in Gen. v. and xi. and also in Exod.

xii: 40, thus presenting a scheme of chronology materially different both from the Masoretic and from that of the LXX. Of the MSS. that have reached Europe none are older than the 10th century.

There is no ground, either external or internal, for assigning to the Samaritan Pentateuch an age earlier than the 4th century B.C., though, from its use in Northern Palestine, it was formerly argued that it must have originated before the fall of the N. kingdom, or even before the revolt of Jeroboam. The Samaritan Targum, a translation of the Hebrew Samaritan Pentateuch into Samaritan Aramaic, is hardly older than the 4th Christian century. It was printed in a very corrupt form in the Paris and London Polyglotts, and there is a critical edition by Petermann and Vollers. The Samaritan Targum of Genesis, in Hebrew characters, is given in Heidenheim's "Bibliotheca Samaritana" (1884). There is also an Arabic translation of the Samaritan Pentateuch, made in the 11th or 12th century by Abu Said, based on the work of Saadia. The Samaritan Pentateuch itself can be read in the Paris and London Polyglotts, or in the separate edition, in square Hebrew characters, by Blayney (Oxford, 1790).

Samaritan Societies, organizations founded on the suggestion of Professor von Esmarch, of Kiel, Germany, for the purpose of rendering prompt aid to the injured. The object had a rapid and widespread recognition, and in September, 1893, the first international convention of the societies was held in Vienna.

Samaritans, a mixed people, which inhabited the region between Judea and Galilee, and formed a sect among the Jews. They consisted partly of the tribes of Ephraim and Manasseh left in Samaria by the King of Assyria when he had carried their brethren away captive, and partly of Assyrian colonists. On the return of the Jews from captivity they declined to mix with the Samaritans, though united with them in religion. The latter attempted to prevent the Jews from building the temple at Jerusalem, and, failing in this, they built a temple on Mount Gerizim exclusively for their own worship. A few of the race still exist scattered in Egypt, at Damascus, and at Gaza. They adhere strictly to the Mosaic law, but are regarded by the Jews as heretics, as they accept only the Pentateuch, of which they have a special version of their own. They believe in the existence of angels, in a resurrection and future retribution, and expect the coming of a Messiah, in whom they look only for a prophet. In the synagogue the Aramaic Samaritan dialect is used, but they generally speak Arabic. They avoid any connections with other sects and marry only among their own nation.

Samarskite, an orthorhombic mineral occurring mostly massive, rarely in crystals, in brown orthoclase. Hardness 5.5 to 6; sp. gr. 5.614 to 5.75; luster, when fractured, shining, sub-metallic; color, velvet black; streak, dark brown, opaque; fracture, sub-conchoidal. Composition: a columbate of uranium, yttrium, iron, thorium, etc.

Samaveda, the second of the four Vedas. It is, in the main, made up of extracts from the hymns of the Rig Veda, used at the Soma sacrifice, but the antiquated grammatical forms show portions of it to be older than the Rig Veda itself.

Sambre, a river of France and Belgium; a tributary of the Meuse, which it enters at Namur; length 110 miles, great part of which is useful for navigation.

Sambuke, an ancient musical instrument; though applied sometimes to several musical instruments of different kinds, such as a lyre, a dulcimer, a triangular harp or trigon, and a large Asiatic harp, it seems to have been chiefly used as a term for the last-named instrument. By some authors it has been identified with the large Eyptian harp.

Samian Ware, a name given to an ancient kind of Greek pottery made of Samian earth, or to a variety of Roman pottery made in imitation of this. The vases are of a bright red or black color, covered with a lustrous siliceous glaze, with separately molded ornaments attached to them.

Samnites, a people of ancient Italy, that inhabited the country between Apulia on the E. and Latium and Campania on the W.; a brave and warlike nation, they distinguished themselves by their implacable hatred of the Romans, with whom from their earliest existence as a people they waged a perpetual hostility. They were, however, ultimately compelled to succumb before the growing power of Rome, and after a successsion of disasters were finally exterminated about 272 B. C. Their capital city was called Samnium, or Samnis. The term Samnites was subsequently applied to an order of Roman gladiators, so named because accoutred and armed in the fashion of the ancient nation of Samnites.

Samoan Islands, a group in the South Pacific Ocean, formerly known as the NAVIGATOR ISLANDS.

Location.— They are located about 2,000 miles S. and 300 miles W. of the Hawaiian Islands and 14° S. of the equator. They lie in an almost direct line between San Francisco and Australia and slightly S. of the direct steamship line connecting the Philippines with the proposed Panama or Nicaraguan interoceanic canals. Their especial importance, therefore, lies more in their position as coaling and repair stations

on these great highways of commerce rather than in their direct commercial value, their population being small and their imports and exports of comparatively little importance.

The group consists of 10 inhabited and 2 uninhabited islands, with an area of 1,700 square miles and an aggregate population, according to the latest estimates, of 36,000 people, of which something over 200 are British subjects, 125 Germans, 25 Americans, 25 French, and 25 of other nationalities, while the remainder are natives of the Polynesian race. The bulk of the population is located in the three islands of Upolou, Savaii, and Tutuila, the number in Upolou being 16,600, in Savii 12,500, and in Tutuila 3,700. The islands are of volcanic origin, but fertile, producing cocoanuts, cotton, sugar, and coffee, the most important, however, being cocoanuts, from which the copra of commerce is obtained by drying the kernel of the cocoanut, the copra, which is exported to Europe and the United States, being used in the manufacture of cocoanut oil. The exportation of copra from the islands in 1896 amounted to 12,565,909 pounds, valued at $231,372. A considerable proportion of this was exported to the United States, a larger proportion, however, to Germany, whose citizens control its commerce through a trading company which has long been established there. The cocoanut and copra productions, however, vary greatly from year to year, owing to the fact that many of the cocoanut trees have been destroyed in recent wars between native factions, a single individual being able, by cutting out the crown of the tree, to permanently destroy in two minutes' time the fruit-bearing qualities of trees which require several years for their growth.

Government.—The government of the Samoan Islands had been from time immemorial under the two royal houses of Malietoa and Tupea, except on the island of Tutuila, which was governed by native chiefs. In 1873, at the suggestion of foreign residents, a house of nobles and a house of representatives were established, with Malietoa, Laupepa, and the chief of the royal house of Tupea as joint kings. Subsequently Malietoa became sole king. In 1887 he was deposed by the German government on the claim of unjust treatment of German subjects, who formed the bulk of the foreign population on the island, and was deported first to German New Guinea and then to the Cameruns, in Africa, and finally in 1888 to Hamburg, Tamasese, a native chief, being meantime proclaimed by the Germans as king, though against the protest of the British and American consuls at Samoa. Mataafa, a near relative of Malietoa, made war upon Tamasese and succeeded to the kingship.

In 1889 a conference between the representatives of the American, British, and German governments was held at Berlin, at which a treaty was signed by the three powers guaranteeing the neutrality of the islands, in which the citizens of the three signatory powers would have equal rights of residence, trade, and personal protection. They agreed to recognize the independence of the Samoan government and the free rights of the natives to elect their chief or king and choose a form of government according to their own laws and customs. A supreme court was established, consisting of one judge styled the chief justice of Samoa. To this court were referred: First, all civil suits concerning real property situated in Samoa; second, all civil suits between natives and foreigners or between foreigners of different nationalities; third, all crimes committed by natives against foreigners or committed by such foreigners as are not subject to any consular jurisdiction.

The future alienation of lands was prohibited, with certain specified exemptions. The capital was located at Apia, the chief town of the group of islands, and a local administration provided for the municipal district of Apia. A commission was appointed to investigate titles to land alleged to have been purchased from the natives, and this in 1894 completed its labors, confirming about 75,000 acres of land to Germans, 36,000 to British, and 21,000 to Americans, though much of this land has since changed hands. Malietoa, who had been deported, was restored as king in November, 1889, and continued as such till his death, which occurred Aug. 22, 1898, when the consuls of the three powers, with the chief justice as president, took charge of the administration pending the election of a successor. Out of the election and recognition of this successor to King Malietoa, deceased, serious disagreements between the local representatives of the three governments maintaining the joint protectorate over the islands occurred. These were followed in 1899 by a new agreement between the three nations, as follows:

Treaty of 1899.—The treaty bears date at Washington, Dec. 2, 1899, and after reciting its purpose to be to adjust amicably questions between the three powers in respect to the Samoan group, and to avoid further misunderstandings, proceeds textually as follows:

Article I. The general act concluded and signed by the aforesaid powers at Berlin on the 14th day of June, A. D. 1889, and all previous treaties, conventions, and agreements relating to Samoa are annulled.

Art. II. Germany renounces in favor of the United States of America all her rights and claims over and in respect to the island of Tutuila and

all other islands of the Samoan group east of lon. 171° W. of Greenwich. Great Britain in like manner renounces in favor of the United States of America all her rights and claim over and in respect to the island of Tutuila and all other islands of the Samoan group east of lon. 171° W. of Greenwich. Reciprocally, the United States of America renounces in favor of Germany all their rights and claims over and in respect to the islands of Upolou and Savaii, and all other islands of the Samoan group W. of lon. 171° W. of Greenwich.

Art. III. It is understood and agreed that each of the three signatory powers shall continue to enjoy in respect to their commerce and commercial vessels in all the islands of the Samoan group privileges and conditions equal to those enjoyed by the sovereign power in all ports which may be open to the commerce of either of them.

Art. IV. The present convention shall be ratified as soon as possible and shall come into force immediately after the exchange of ratifications.

A separate treaty was negotiated to cover the provisions for the settlement of claims in Samoa. It set forth that the three governments are "desirous of effecting a prompt and satisfactory settlement of the claims of the citizens and subjects of their respective countries resident in the Samoan Islands on account of recent military operations conducted there, and have concluded a convention for the accomplishment of this end by arbitration."

The King of Sweden and Norway was made arbitrator, and was not only to determine the amount of claims, but to decide to "what extent either of the three governments is bound, alone or jointly with the others, to make good these losses."

The nature of the claims to be adjusted was set forth in Article I. of this treaty, as follows:

"All claims put forward by American citizens or German or British subjects, respectively, whether individuals or companies, for compensation on account of losses which they allege that they have suffered in consequence of unwarranted military action, if this be shown to have occurred, on the part of Americans, German or British officers, between the 1st of January last and the arrival of the joint commission in Samoa, shall be decided by arbitration in conformity with the principles of international law or considerations of equity."

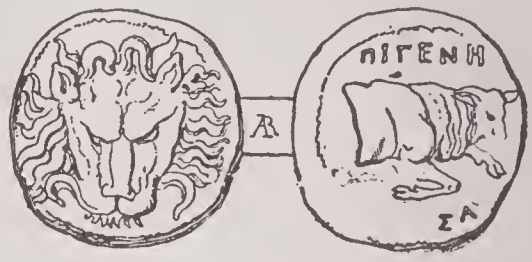
There was also a provision to the effect that:

"either of the three governments named, with the consent of the others, previously obtained in every case, submit to the king for arbitration similar claims of persons, not being natives, who are under the protection of that government and who are not included in the above-mentioned categories."

The award of King Oscar was given in October, 1902, and held that both Great Britain and the United States were responsible for the losses sustained in 1899. See APIA: PAGO PAGO: TUTUILA.

Samolus, a genus of plants, order *Primulaceæ*. They are herbs with alternate leaves, and flowers corymbose or racemose. *S. valerandi*, the water pimpernel, found in wet, gravelly places throughout the world, is one foot high, and has small, white flowers, the corolla of which is twice the length of the calyx.

Samos, now **Samo,** an island in the Grecian Archipelago near the coast of Asia Minor; 45 miles S. W. of Smyrna, forming a principality tributary to Turkey; area, 180 square miles. It has a mountainous surface, partly covered with pine forests; several fertile and well-watered valleys; produces corn, fruit, and excellent wine; and has several valuable minerals, including argentiferous lead, iron, and marble. The principal town is Vathe, with a good harbor on the N. E. side of the island. The principal exports are raisins, skins, wine, and oil; imports, grain, colonial produce, and woven fabrics. Samos was inhabited in antiquity by Ionian Greeks, and had an important position among the Greek communities as early as the 7th century B. C.



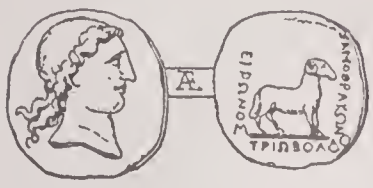
COIN OF SAMOS.

In the latter half of the 6th century it was in a specially flourishing condition under Polycrates, and subsequently was under the domination of Athens. In 84 B. C. it was united with the Roman province of Asia. In 1550 it was conquered by the Turks. It now occupies an exceptional position, having been erected into a tributary principality of the Sublime Porte in 1832, the ruler being a Greek prince. Pop. (1902) 53,424.

Samosata, the capital till A. D. 73 of the Syrian kingdom of Commagene, on the Euphrates, 130 miles N. N. E. of Aleppo. It was the birthplace of Lucian and of Paul of Samosata.

Samosatenes, in Church history, the followers of Paul, born in Samosata, who combined the bishopric of Antioch in Syria with the civil office of procurator for the emperor in a province. His tendencies were strongly rationalistic. He believed in one God the Father. The "Word" was not a substance or a person, but inhered in the Father as reason does in the human mind. Christ was a mere man, with whom the World of Wisdom was united at the time of his birth; by this means he was enabled to speak and act as he did, and might, in an inferior sense, be called the Son of God, and even God. Paul was condemned and deposed by the Council of Antioch A. D. 269. Called also Paulianists.

Samothrace, or **Samothraki,** an island in the N. of the Ægean Sea, belonging to Turkey, about 14 miles long by 8 miles broad. It has a very mountainous surface, one of its summits exceeding 5,000 feet. Its chief products are corn and oil. The island is of interest as being in antiquity the chief seat of the worship of the CABIRI (*q. v.*), and celebrated for its religious mysteries. It is interesting also as being visited by St. Paul in the course of his second missionary journey (Acts xvi: 11). Recent archæological researches have produced valuable results.



COIN OF SAMOTHRACE.

Samovar, a Russian tea apparatus, the water in which is boiled by means of hot coals contained in an iron tube, and then poured over the tea.

Samoyedes, or **Samoiedes,** a people of Ural-Altaic stock, inhabiting the shores of the Arctic Ocean, both in Europe and Asia, from the Yenisei to the White Sea. They consist of two main groups, a S. resembling the Tartars, and a N. and more degraded group. They are nomadic, and live chiefly by fishing, hunting, and keeping reindeer. They are of small stature, have a flat, round, and broad face, thick lips, wide nose, little beard, black hair in small quantity. Ther religion is fetishism, though they have an idea of a great divinity; they are extremely superstitious, and generally peaceable. The reindeer supplies them with food, clothing, tents, utensils, etc. They number about 25,000.

Samp, an article of food consisting of maize, broken or bruised, which is cooked by boiling, and often eaten with milk; a dish borrowed from the aborigines of the United States.

Sampan, a boat of various build used on the Chinese rivers, at Singapore, and elsewhere, for the conveyance of merchandise, and also frequently for habitation. They are swift sailers both with oar and sail.

Sampey, John Richard, an American theologian; born in Fort Deposit, Ala., Sept. 27, 1863; was graduated at Harvard University in 1882 and at the Southern Baptist Theological Seminary in 1885; was an instructor in the latter in 1885–1892; then was made Professor of Old Testament Interpretation there. His publications include "The First Thirty Years of the Southern Baptist Theological Seminary" (1890); "Old Testament Syllabus" (1899); etc.

Samphire, the *Crithmum maritimum,* an umbelliferous plant, very succulent, pale green, with bi-triternate leaves and lanceolate fleshy leaflets. It grows wild along the sea coast of Europe, and where it abounds it is used by the inhabitants as a pickle, as an ingredient in salads, or as a potherb.

COMMON SAMPHIRE.

Sample, a specimen; that which is taken out of a larger quantity as a specimen; a part of anything presented for inspection, or intended to be shown, as evidence of the quality of the whole; as, cotton is purchased by sample, give me a sample of the goods. A pattern; an example; an instance; as, is this a sample for me to follow?

Sample, Robert Fleming, an American clergyman; born in Corning, N. Y., Oct. 19, 1829; was graduated at Jefferson College in 1849; was pastor in Bedford, Pa., in 1856–1866, and in Minneapolis, Minn., in 1868–1887. Subsequently he became Professor of Christian Ethics at Lincoln University. He was several times moderator of the Presbyterian General Assembly of the United States. His publications include "Shining Light" (1862); "Clouds after Rain" (1863); "Sunset" (1864); "Memoir of Rev. J. C. Thom" (1868); "Beacon Lights of Reformation" (1889); "Christ's Valedictory" (1900); "Elements of Pulpit Powers"; etc. He died in 1905.

Sampler, a pattern or model of work; a specimen; particularly, a piece of needle work sewed by learners, containing specimens of various kinds of stitches. Also one who apportions things into samples for inspection; as, a tea sampler.

Sampson, Deborah, an American heroine; born in Plymouth, Mass., Dec. 17, 1760. She served in the Continental army during the Revolutionary War, in the disguise of a man, under the name of Robert Shurtleff, and greatly distinguished herself for bravery. In 1797 she published "The Female Review," in which she related her experiences in the army. She died in Sharon, Mass., April 29, 1827.

Sampson, William Thomas, an American naval officer; born in Palmyra, N. Y., Feb. 9, 1840. He attended the public schools of his native town, and in 1857 entered the United States Naval Academy, from which he was graduated in 1860, and was assigned to duty on the frigate "Potomac." On July 16, 1862, he was promoted lieutenant and assigned to the practice ship "John Adams." In 1864 he was appointed executive officer of the ironclad "Patapsco," of the South Atlantic Blockading Squadron, and which was blown up in Charleston harbor Jan. 15, 1865, while he was on board. After serving on the frigate "Colorado," of the European squadron, he was promoted lieutenant-commander July 25, 1866; commander Aug. 9, 1874; and captain, March 26, 1889. Subsequently he was superintendent of the United States Naval Academy; a member of the International Prime Meridian and Time Conference; superintendent of the Torpedo Station; member of a board

REAR-ADMIRAL SAMPSON.

on fortifications and other defenses; chief of the Bureau of Naval Ordnance; superintendent of the Naval Observatory; a delegate from the United States to the International Maritime Conference in Washington; and president of the Board of Inquiry on the "Maine" disaster. On March 24, 1898, he was appointed commander of the North Atlantic squadron, succeeding Rear-Admiral Sicard, with the rank of rear-admiral. On June 1 he joined Commodore Winfield S. Schley, commander of the "Flying Squadron," off Santiago de Cuba, and took command of the combined squadrons, which included 16 warships. When it was known that the Spanish fleet under command of Admiral Cervera was blockaded in the harbor of Santiago, Admiral Sampson prepared a plan of operations for his fleet, to check any attempt at escape that Cervera might make. In assigning places for his different ships, he stationed the "New York," his own flagship, and the "Brooklyn," on which Commodore Schley was serving, on the two flanks, as these were the fastest ships in the fleet. When the Spanish vessels made their dash out of Santiago harbor, Admiral Sampson was absent from the fleet with the "New York," having gone to Siboney for a conference with General Shafter. The "New York" turned back and rejoined the fleet, arriving just in time to participate in the last engagement, which had thus been fought by Commodore Schley as second in command. Admiral Sampson was promoted rear-admiral on Aug. 12, 1898; appointed commander of the Boston navy yard on Oct. 14, 1899; and was relieved of this command, owing to ill health, Oct. 1, 1901. On Feb. 9, 1902, was retired on reaching the age limit. He died May 6, 1902. For details of the naval battle of Santiago, see SANTIAGO, BATTLE OF, and for the subsequent controversy as to the credit for the victory, see SCHLEY, WINFIELD SCOTT.

Samson, in Scripture, the son of Manoah, of the tribe of Dan. He was endowed with extraordinary strength and obtained several advantages over the Philistines. At length his mistress betrayed him into the hands of his enemies, who put out his eyes, and made him work at a mill. On a public festival when the Philistine lords were assembled in the temple of Dagon, Samson was sent for to show them sport. Laying hold of two pillars of the temple as if to support himself, he pulled down the building and was buried in the ruins, with more than 3,000 Philistines.

Samson Post, in shipbuilding, a pillar resting on the keelson and supporting a deck-beam. Also a spar sustained in a vertical position by guys, and used as a jib for the suspension of hoisting-tackle, for getting boats aboard, fishing the anchor, etc.

Samuel, in Scripture, a prophet and judge of Israel, of the tribe of Levi, was called in his youth, while attending Eli, the high priest. He consecrated Saul King of Israel and was afterward commanded to anoint David. After governing Israel either alone or in conjunction with Saul during 50 years, he died in the 90th year of his age, 1072 B. C.

Books of Samuel, two of the ceremonial books of the Old Testament, called after the prophet Samuel, their reputed author. They were anciently reckoned as one book by the Jews, the present division into two being derived from the Septuagint and Vulgate. Various attempts have been made to determine the age and authorship of these books, with more or less of probability. The common opinion, founded on I Chron. xxix: 29, is that the first 24 chapters were written by

Samuel himself, and the remainder by Nathan and Gad. There is no reason to believe, however, that these documents were identical with the present Books of Samuel. From Samuel and Kings being sometimes called the four Books of Kings, John is of opinion that they were all written by the same person, and at a date so recent as the thirtieth year of the Babylonish captivity. This hypothesis, however, will not stand the test of criticism. The language and style of the books are very different, denoting different periods and different authors. The Books of Samuel bear the impress of a hoary age in their language, allusions, and mode of composition. The insertion of odes and snatches of poetry, to enliven and verify the narrative, is common to them with the Pentateuch. They appear to have been made up from documents contemporary, or nearly so, with the events to which they refer, and wrought into their present form by some later hand. With respect to the person who compiled and brought them together in their present form, all that can be affirmed with probability is that he lived not long after the time of David. Though much has been made of discrepancies and contradictory statements that are said to occur in these Books, their historical character is abundantly supported both by external and internal evidence. Portions of them are quoted or referred to in the New Testament, and allusions to them also occur in the Book of Psalms, to which they often furnish historical illustration.

Sanaa, the former capital of the Imâms of Yemen; 200 miles N. by W. of Aden, in a broad grassy valley, sheltered by hills 1,200 and 1,500 feet high; is itself 4,000 feet above the sea. The city and its suburbs are surrounded by walls, and overlooked by a couple of ruined fortresses. In 1872 it submitted to Turkish rule, and has since then declined in commercial importance and been allowed to fall into decay. Pop., about 20,000.

San Angelo, a town of Texas, county-seat of Tom Green co., 299 miles N. W. of Austin; on the Concho river, and on the Gulf, Colorado, and Santa Fé, and the Kansas City, Mexico, and Orient railroads. It has good private and public schools, and the leading religious denominations are represented and own buildings. Well-equipped water-supply and electric-lighting systems are in operation. The four banks in 1907 had deposits of $2,000,000. San Angelo is an important shipping point. Cattle, sheep, and wool shipped in 1906 were valued at $3,500,000. The yearly pecan crop averages $75,000. There is an assessed property valuation of $3,000,000. Pop. (1900) about 4,000; (1910) 10,321.

San Antonio, a city of Texas, the largest in the State and county-seat of Bexar co., 80 miles S. W. of Austin; on the Southern Pacific, Missouri, Kansas, and Texas, San Antonio and Aransas Pass, International and Great Northern, and San Antonio and Gulf railroads. Owing to the artesian and other mineral wells and the dry climate, it is visited by many invalids. Mild winters and scenes of local and historic interest make it the winter resort of the Southwest. The United States military department of Texas has its headquarters here, the government post, Fort Sam Houston, containing 585¼ acres. There are numerous private and public schools, and 11 religious denominations are represented by 53 buildings, including San Fernando Cathedral (R. C.). Among the public buildings are the court house, the city hall, the Federal building, and the combination market house and convention hall. San Antonio had in 1907 61 miles of electric street railways, 22 parks and plazas, about 80 miles of sewers, 148 manufacturing plants, and 13 banks with $12,000,000 on deposit. The property valuation was placed at $35,639,481. The city is the center of large cattle and sheep industries, and of fruit-growing and other interests. San Antonio was settled by the Spaniards in 1689. It was the scene of frequent conflicts between the Spanish and the Indians, French, or Americans. On March 6, 1836, occurred the massacre of the Alamo (see ALAMO, THE). San Antonio has been under seven governments—Spanish, French, Mexican, Mexican Charter, Texas Republic, Confederate, and United States. A number of missions, of which the Alamo and Concepcion are the most noted, still stand in and around the town. A large percentage of the population is Mexican, and Spanish language and customs are in great evidence. Pop. (1900) 53,321; (1910) Federal census, 96,614.

San Antonio, the name of several capes: (1) A cape at the S. entrance to the Rio de la Plata, in the Argentine Republic; (2) a cape in Spain, on the E. coast, in the province of Alicante, and extending into the Mediterranean Sea; (3) a headland in Brazil, at the entrance to the Bay of Bahia, and on which is a lighthouse at the altitude of 140 feet above the sea; (4) the N. E. rocky peak, or pointed headland, in the island of Koonasheer, one of the Kooril group; (5) the W. point of Cuba.

San Antonio, a river in Texas, formed by the union of Leon creek and Medina river, in Bexar county. Its course is E. and through Wilson, Karnes, and Goliad counties. It flows into Espiritu Santo Bay, an indenture of the Gulf of Mexico, and is nearly 200 miles long.

Sanbenito, a coat of sackcloth worn by penitents on their reconciliation to the

church. Also a loose cloak or upper garment worn by persons condemned to death by the Inquisition on their way to the *auto da fé*. They were painted over with flames, figures of devils, the person's own portrait, etc.; or in the case of those who expressed repentance for their errors, with flames directed downward. Those worn by Jews, renegades, and sorcerers bore a St. Andrew's cross in red on back and front.

San Bernardino, a mountain peak in California; the highest point of the Coast Range; elevation 11,600 feet.

San Bernardino, a city and county-seat of San Bernardino co., Cal.; on the Southern California railroad; 60 miles E. of Los Angeles. It is the center of the great San Bernardino basin and is surrounded by a rich mining, agricultural, and fruit-growing region. Within view of the city is Mount San Bernardino, the highest peak of the Coast Range. Here are a court house, costing $350,000, the Hall of Records, St. Catharine's Academy, a high school, churches and hotels, several National and State banks, and daily and weekly newspapers. The city contains the extensive shops of the Southern California railroad. Pop. (1890) 4,012; (1900) 6,150; (1910) 12,779.

Sanborn, Alvan Francis, an American journalist; born in Marlboro, Mass., July 8, 1886; was graduated at Amherst College in 1887 and then studied in the School of Political Science at Columbia University; was engaged in editorial work in 1888–1889; became the Paris correspondent of the Boston "Transcript" in 1899. His publications include "Moody's Lodging House and Other Tenement Sketches" (1895); "Meg McIntyre's Raffle, and Other Stories" (1896); etc.

Sanborn, Franklin Benjamin, an American journalist; born in Hampton Falls, N. H., Dec. 15, 1831; was graduated at Harvard University in 1855 and early turned his attention to journalism. He was editor of the Boston "Commonwealth," the Springfield "Republican" and the "Journal of Social Science" in 1876–1897; published 20 State reports on charities, labor, etc.; lectured extensively at Cornell, Smith, and Wellesley Colleges, and at the Concord School of Philosophy; and was intimately associated with various State and private charitable organizations. His publications include biographies of Emerson, Thoreau, Alcott, John Brown and Dr. Earle, and numerous social and philosophic papers and lectures.

Sanborn, John Benjamin, an American military officer; born in Epsom, N. H., Dec. 5, 1826; was educated at Dartmouth College; studied law, and was admitted to the bar in 1854. In the Civil War he served first as organizer of Minnesota troops and later took part in the battles of Iuka, Corinth, Port Gibson, Raymond and Vicksburg. In 1864 he took command of the District of Southwest Missouri, and in 1865 fought against the Indians of the Southwest. He was appointed to settle the Indian difficulties in 1866; member of the Indian Peace Commission in 1867-1868. He died in 1904.

Sanborn, Katharine Abbott, an American miscellaneous writer and lecturer; born in Hanover, N. H., July 11, 1839. She was Professor of English Literature in Smith College for several years, and resigned in 1886. Her publications under the name of "Kate Sanborn" include: "Home Pictures of English Poets"; the "Round Table Series of Literature Lessons"; "The Vanity and Insanity of Genius"; "A Year of Sunshine"; "Adopting an Abandoned Farm"; "Abandoning an Adopted Farm"; "The Wit of Women"; "Favorite Lectures"; "My Literary Zoo"; etc.

Sancho, a negro instrument of the guitar species, made of hollowed wood and furnished with a long neck. It is strung with the tough fibers of a creeping plant. It is tuned by means of sliding rings.

Sanchuniathon, the supposed author of a Phœnician history of Phœnicia and Egypt, called "Phoinikika." He is supposed to have been a native of Berytus; and the accounts which speak of him as born at Sidon or Tyre probably take these cities in their wider sense for Phœnicia itself. Our principal information about him is derived from Philo of Byblus, a Greek writer of the beginning of the 2d century A. D., who translated Sanchuniathon's history into his own tongue; but both the original and the translation are lost, save a few small portions of the latter, preserved by Eusebius, who uses them as arguments in a theological dispute against Porphyry. According to Philo, Sanchuniathon lived during the reign of Semiramis, Queen of Assyria, and dedicated his book to Abibalus, King of Berytus. Athenæus, Porphyry, and Suidas speak of him as an ancient Phœnician, who lived "before the Trojan war." There is also a discrepancy between the various ancient writers respecting the number of books contained in the "Phoinikika." Orelli (1826), and after him C. Müller (1849), published the remaining fragments of Sanchuniathon, and the discussion raised on their genuineness and value can hardly be said to be yet at rest. Several critics went so far as to deny the fact of the existence of a Sanchuniathon point blank. According to some it was Eusebius, according to others, Philo, who fathered his own speculations on an ancient authority. The latter was actuated, Movers thinks, partly by the desire of proving that the whole Hellenistic worship and religion was simply a faint imitation of the Phœnician; partly by the desire of lowering

the value of the Old Testament by showing the higher authority of the Phœnician writer; and partly, as was the fashion among the unbelieving philosophers of his age, to bring the popular creed into a bad reputation by proclaiming his own views under the guise of an ancient sage. Yet even those who deny the authenticity of Sanchuniathon agree in allowing the fragments current under his name a certain intrinsic value, they being founded on real ancient myths. This, in fact, is now, with more or less modification on the part of the different investigators, Ewald, Bunsen, Renan, etc., the prevalent opinion. Ewald contends for the real existence of a Sanchuniathon, in which he is supported by Renan. Even if there never was a Sanchuniathon it was not Philo who forged him. There seems no doubt that we have but a very dim and confused reproduction of what, after many modifications, misunderstandings, and corruptions, finally passed the hands of Philo and Eusebius, and was by the Church Father, as has been said, quoted in a theological disputation. Yet, even assuming the person of a Sanchuniathon, his age — and Eusebius insists on a very remote one indeed — must be placed much lower; into the last centuries before Christ, at the earliest. He would then, it seems, have endeavored to stem the tide of Greek superiority in all things, by collecting, grouping, and remodelling the ancient and important traditions of his own country, and thus proving to both his countrymen and the Greeks their high importance, in comparison with the Greek productions, in the field of religion and philosophy.

The "Phoinikika" was not only a cosmogony, it would appear, but a history of his own and the surrounding nations; and, like similar ancient histories, it probably began with the creation of the world, and contained an account of the Jews. All the historical parts, however, are lost and nothing remains but a fragmentary cosmogony, or rather two or three different systems of cosmogony, or, according to Movers, merely an Egyptian and Phœnician patchwork. One of the chief difficulties for us consists in the Phœnician words of Sanchuniathon, which Philo either translated too freely or merely transcribed so faultily in Greek characters as to leave them a puzzle.

Eusebius further contains a fragment of a treatise by Sanchuniathon, "Peri Ioudaiōn," but it is doubtful whether this is the work of Philo of Byblus or of Sanchuniathon; and if it be that of the latter, whether it is a separate work or merely a separate chapter out of his larger work. A forgery, said to contain the whole nine books of Sanchuniathon, and to have been found by a Portuguese, Colonel Pereira, at the convent of St. Maria de Merinhao, and to have been by him entrusted to a German corporal in Portuguese service, named Christoph Meyer, was published by Wagenfeld (Bremen, 1837), and translated into German (Lübeck, 1837), but was very soon consigned to disgrace and oblivion by Movers, K. O. Müller, and Grotefend, the last of whom at first believed and even wrote a preface to the *editio princeps*. There never was such a convent or such a colonel; but the fac-simile taken by "Pereira" in the convent in Portugal was found to have been written on paper showing the water marks of an Osnabrück paper mill.

San Cristóbal, (1) Capital of the state of Chiapas, Mexico; has a handsome capitol, a cathedral, and a secondary school. (2) A town of Venezuela, in the state of Los Andes, with streets straight, but much cut up by small ravines; an important trade (especially in coffee), mainly in the hands of Germans and Danes; deposits of coal beside the town, and near by copper mines and petroleum wells.

Sancroft, William, an English prelate; born in Suffolk, England, Jan. 30, 1616; was educated at the University of Cambridge, and obtained a fellowship in 1642, but was ejected because he refused to sign the "engagement" to support the Covenant and the Presbyterian party. After the Restoration he became successively dean of York and St. Paul's, in 1668 archdeacon, and in 1678 archbishop of Canterbury. He was committed to the Tower in 1687 with six other bishops for refusing to read the Declaration of Indulgence, but they were all acquitted. On the Revolution settlement he became a non-juror, and thereby forfeited his archbishopric. He was succeeded by Tillotson, and lived secluded till his death in Fressingfield, Nov. 24, 1693.

Sanctification, a term applied in Scripture, as well as in theology, to denote the process by which the effaced image of God in man is restored, and the sinner becomes a saint. It is based on the holiness of God, who communicates His purity to His people by means of the Holy Spirit. Sanctification is distinguished from justification in this, that while justification changes the state of the sinner in law before God as a judge, sanctification changes the heart before Him as a father. Justification precedes sanctification; the one removing the guilt, the other the power of sin. The former is an act done at once, the latter is a gradual process.

Sanctuary, among the ancient Jews the innermost chamber of the tabernacle — afterward of the temple, in which was kept the ark of the Covenant, and was never entered, except by the high priest once a year. It was also called the Holy of Holies. *Sanctum Sanctorum*. In the Christian Church,

the bema, or inner portion of the church, immediately round the altar, was called the sanctuary. From the sacred character of the churches, and from the rising power of the clergy, they came to be resorted to as asylums by fugitives from the hands of justice, and afterward certain churches were set apart specially for that purpose, and were termed "sanctuaries." This seems to have been originally intended only to prevent sudden violence, and to give time for the regular administration of the law, and perhaps, in the case of certain delinquencies, for the intercession of the Church. The abuses to which this system gave rise, as tending entirely to defeat the ends of justice, led to its abolition in all the Christian countries.

Sanctus, a part of the communion service in the Church of England, and a part of the mass in the Church of Rome, beginning with the word "Sanctus" in the latter, and "Holy" in the former. In many cathedrals where it is not usual to celebrate chorally, the sanctus is used as an introit.

Sanctus Bell, or **Saint's Bell,** a small bell which is rung in order to mark the progress of the office of the mass. In some churches bells of this kind are placed outside the church, so that those unable to be present inside may be reminded of important parts of the service. A hand bell is now often used.

Sand, comminuted fragments of igneous, metamorphic, or volcanic rocks, or of chert, flint, etc. They are detached from the parent rock, and as bowlders and pebbles are ground against each other by water on sea-beaches or in any similar way. The colors of sand correspond to those of the minerals in the rocks from which they were detached. It may be red, white, gray, or black, but when quartzose, as it often is, it is normally reddish-yellow, from oxide of iron. Sea-sand often contains Foraminifera, spicules of sponges, minute fragments of shells, portions of the body of Echinoderms. (See SANDSTONE.) In the plural, tracts of land consisting of sand, as the deserts of Arabia or Africa; also, tracts of sand left exposed by the ebb of the tide.

Sand, Musical, sand which, under certain conditions, gives out a musical sound. The phenomenon occurs on sea beaches in many localities in different parts of the world; thus there are two "singing beaches" in Massachusetts — one at Manchester, the other at Monomoy Point; there is such a beach also near Plattsburg, N. Y., on Lake Champlain. A noteworthy instance is at the Djebel Nagous (bell mountain) on the Gulf of Suez; but the most striking is in the district of Mana, on the S. coast of Kauai, Hawaii. Owing to a fancied resemblance of the sound emitted by the sand in that locality to a dog's bark, the Kauai musical sand is known as "barking" sand. Till 1890 no naturalist had studied the Kauai sands in their relations to similar formations elsewhere — consequently their true character could not be determined with precision; but in the spring of that year, Prof. H. Carrington Bolton of Trinity College, Hartford, Conn., who had already examined the sands of Djebel Nagous and of other notable localities, visited Kauai for the sole purpose of investigating the phenomenon. On the coast of the Mana district is a series of sand dunes extending about a mile nearly parallel to the sea. The Pali cliffs form their W. limit; on the E. the range terminates in a dune more symmetrical in shape than most of the others. This, like the other dunes, is about 100 feet in height and about 100 yards from the sea; this is the dune of the "barking" sands. If the sand is perfectly dry, on disturbing its equilibrium on the slope of the dune (31°), it rolls down the incline, emitting a sound characterized by Professor Bolton as "a deep bass note of a tremulous character," but which a companion observer compared to the hum of a buzz saw. The drier the sand and the greater the amount of it set in motion, the louder is the sound; when a large mass of sand was set in motion, the sound was audible at the distance of 105 feet from the base of the dune. When the sand is clapped between the hands, a slight "hoot-like" sound is heard. Sand possessing similar properties occurs in certain other Hawaiian localities — *c. g.*, near Koloa, in Kauai, and on the little island of Niihau. One peculiarity of the sonorous sands of Hawaii is that they consist wholly of carbonate of lime, while sonorous sands of all other localities known to Professor Bolton (over 100 in number) are siliceous. The property of sonorousness in sands of sea beaches and deserts is held by him to be due to thin pellicles or films of air, or of gases thence derived, deposited and condensed on the surface of the sand grains, during gradual evaporation, after wetting by the seas, lakes, or rains. By virtue of these films, the sand grains become separated by elastic cushions of condensed gases, capable of considerable vibration, and whose thickness has been approximately determined. The extent of the vibrations, and the volume and pitch of the sounds produced, after any quick disturbance of the sand, are found to be largely dependent on the forms, structures, and surfaces of the sand grains, especially on their freedom from fine silt or dust. See SAHARA, DESERT OF.

Sand, George, best known name of MADAME ARMANTINE LUCILE AURORE DU PIN DUDEVANT, one of the greatest of French novelists; born in Paris, July 5, 1804. She was the daughter of Maurice

Dupin, an officer of the republican army, who was descended from a natural daughter of Marshal Saxe. Till the age of 14 she was brought up at the Château of Nohant, near La Châtre (department of Indre), mostly under the eare of her grandmother, afterward spending nearly three years in an Augustinian eonvent in Paris. In 1822 she married Baron Dudevant, to whom she bore a son and a daughter; but in 1831 separated from him, and took up her residence

MME. GEORGE SAND.

in Paris. In eonjunetion with Jules Sandeau, a young lawyer, she wrote "Rose and White," which was published in 1831, with the pseudonym Jules Sand. The reception it met with afforded her an opportunity of publishing a novel solely by herself — "Indiana," under the name of George Sand, which she ever after retained. "Indiana" had a brilliant success, but exeited much critieism by its extreme views on social questions. This was also the case with many others of her works. "Valentine," "Lélia," "Jacques," "André," "Leone Leoni," "Simon," "Mauprat," "The Last Aldine," "Lavinia," "Metella," and others, appeared within the first few years after her début. She visited Italy with Alfred de Musset; and lived eight years with Frédéric François Chopin, the composer. These relations also influenced or oecasioned some of her works (as "She and He," 1858). In 1836 she obtained a judicial separation from her husband, with the eare of her children. She took an active interest in the revolution of 1848, and eontributed eonsiderably to newspaper and other political literature. In 1854 she published "Story of My Life," a psychological autobiography. Among her later novels are: "The Man of Snow," "Sylvestre," "The Devil's Pool," "François Champi," "Little Fadette," "Jean," "Teverino," "The God-daughter," "The Master Bellringers." Her published works eonsist of upward of 60 separate novels, a large number of plays, and numerous articles in literary journals. She died in Nohart, June 8, 1876.

Sandal, a protection for the foot, worn in ancient times, and which, in the Authorized Version of the Old Testament, is usually denoted by the word translated shoe. It was usually a sole of hide, leather, or wood, bound on the foot by thongs; but it may sometimes denote such shoes and buskins as eventually eame into use. Jewish ladies appear to have paid great attention to the beauty of their sandals, which, probably, did not differ much from those used in Egypt, excepting, perhaps, that from the greater roughness of their eountry, they were usually of more substantial make and materials. The Egyptian sandals varied slightly in form; those worn by the upper classes, and by women, were usually pointed and turned up at the end, like our skates and many of the Eastern slippers at the present day. In transferring a possession or domain, it was customary among the Jews to deliver a sandal (Ruth iv: 7), as in our Middle Ages, a glove. Hence, the action of throwing down a shoe on a region or territory was a symbol of occupancy (Ps. lx: 10). It was undoubtedly the custom to take off the sandals on holy ground, in the act of worship, and in the presence of a superior. Hence the command to take the sandals from the feet under such circumstances (Exod. iii: 5; Josh. v: 15). This is still the well-known custom of the East — an Oriental taking off his shoe in cases in which a European would remove his hat. The shoes of the modern Orientals are, however, made to slip off easily, which was not the case with sandals, which required to be

SANDALS.

unbound with some trouble. This operation was usually performed by servants; and hence the aet of unloosing the sandals of another became a familiar symbol of servitude (Mark i: 7; Luke iii: 16; John i: 27; Aets xiii: 25).

Sandal Wood, the wood of *Santalum album,* a small, greatly branched, evergreen tree, with leaves opposite and entire, which have been compared to those of the myrtle, as the inflorescence, an axillary and terminal thyrsus, has been to that of the privet. The flowers are at first yellowish, but afterward of a deep ferruginous hue. Though they are inodorous, the wood when cut, especially near the root, is highly fragrant. It grows in the dry region of Southern India, and in the islands of the Indian Archipelago. When felled the trunk is about nine inches or a foot in diameter. It is then barked, cut into billets, and buried in a dry place for about two months. It is largely exported from India to China and Arabia, and, to a certain extent, to Europe. The heart wood is used in the East for carving, for incense, and for perfume. The seeds yield by expression a thick viscid oil, burnt by the poorer classes in India. An essential oil is also distilled from the wood. Hindu doctors consider sandal wood sedative and cooling, and use it in gonorrhœa. The sandal wood of the Sandwich Islands is derived from *S. freycinctianum* and *S. paniculatum.* Red sandal wood is the wood of *Pterocarpus santalinus,* growing in Coromandel and Ceylon. In occidental pharmacy it is used only to color the compound tincture of lavender. In India the name is also given to *Adenanthera pavonina.*

Sandal-wood Island, or **Jeendana,** a large island in the Indian Archipelago, belonging to the Dutch residency of Timor, crossed by the meridian of 120° E.; area, 4,966 square miles; with a population of about 1,000,000. The coast is bold, and terminates at the S. extremity in a lofty and inaccessible peninsula. The interior is mountainous. Edible birds' nests, bees' wax, and sandal wood are obtained here. The natives are described as treacherous and ferocious.

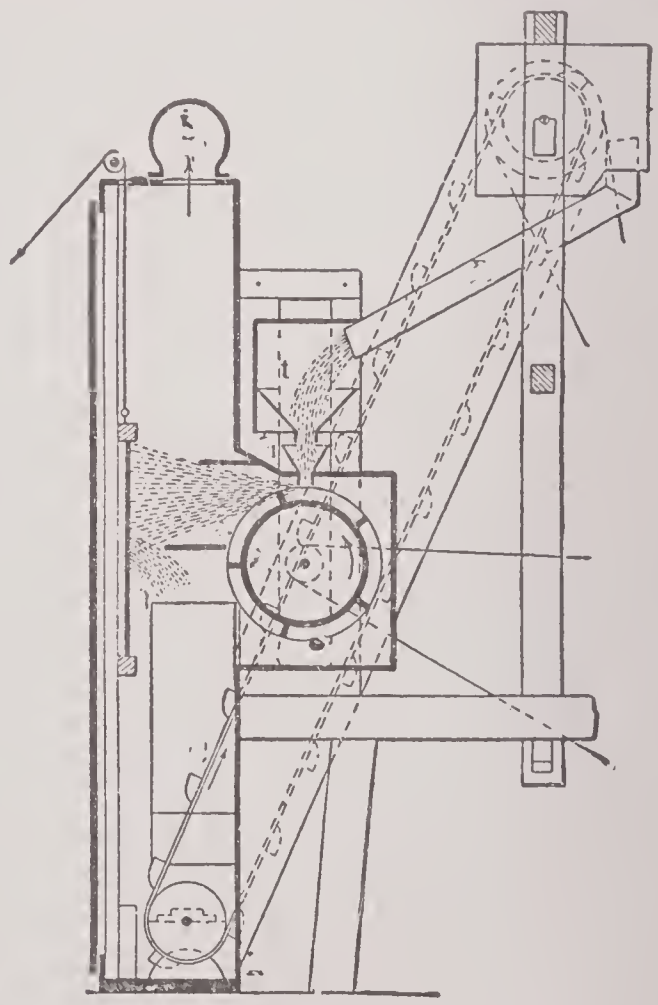
Sandarac, or **Sandarach Resin,** a friable, dry, almost transparent, tasteless, yellowish white resin, which is imported from Mogador, Morocco. It is completely soluble in oil of turpentine, but not completely soluble in alcohol. When heated, or sprinkled on burning coals, it emits an agreeable balsamic smell. It exudes from the bark of the sandarac tree (*Callitris quadrivalvis*), a native of the N. of Africa, of the natural order *Coniferæ.* The quantity of sandarac used is not great; it is employed in making varnish, and generally speaking for the same purposes as mastic. The Australian species also exude sandarac. The finely powdered resin is rubbed, as pounce, on the erasures of writing paper, after which they may be written on again without the ink spreading. The mottled butt wood of the sandarac tree is highly balsamic and odoriferous, extremely durable and valuable for cabinet makers. It brought fabulous prices in Pliny's time. A current error is that the gum of the juniper is identical with sandarac.

Sanday, one of the Orkneys, an island of very irregular shape, generally with a very flat surface and a light sandy soil; greatest length, 13 miles. There are a number of small lakes. There is another small island of the same name in the Inner Hebrides, connected with Canna at low water, 4 miles N. W. of Rum.

Sand-bag, a leathern cushion, tightly filled with fine sand, used by engravers to prop their work at a convenient angle, or to give motion to a place or wood-cut, in engraving curved lines, etc. In fortifications (plural), bags of coarse canvas filled with sand, used in cases where cover for troops is required to be speedily obtained, as a temporary revetment for parapets, etc.

Sandbergerite, a variety of Tennantite and containing over 7 per cent. each of zinc and antimony. The cleavage is stated to be cubic. Found at Morococha, Peru.

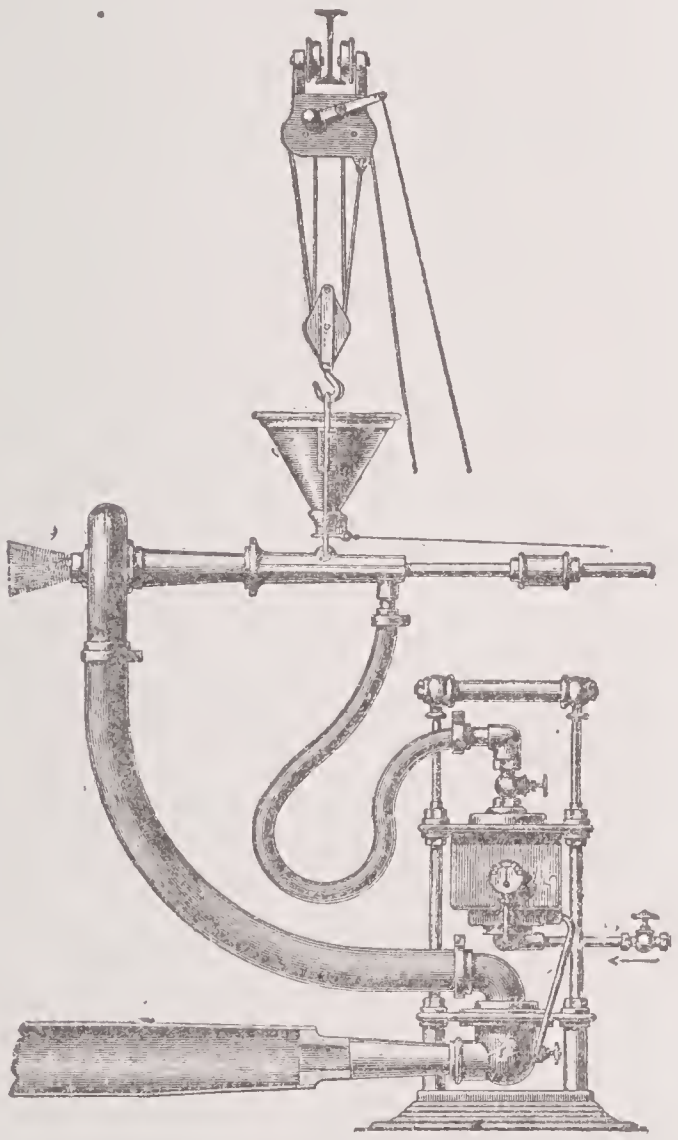
Sand Blast, one of the most wonderful uses of sand, by means of which glass, stone, metals, or any other hard substance may



SAND BLAST APPARATUS: SECTION.

be cut or engraved. If a stream of sharp sand be let fall from a high box (as high as the ceiling of a room) through a tube on to a plate of glass held under it, the sand

will cut away little grains of the glass till at length the whole surface will be cut or scratched and it will look like ground glass. If, instead of cutting the glass all over, it is wanted to engrave a pattern or figure on it, the workman has only to cover the parts of the glass which he does not want cut with a stencil plate made of leather, rubber, paper, wax, etc., for the sand will not cut any soft substance. By this means only the uncovered parts are cut, and when the stencil is taken off the pattern will be seen. Mr. Tilghman of Philadelphia, who first found out how to do this, made a machine in which the sand is blown on to the



SAND BLAST APPARATUS.

thing to be cut by a blast of air or steam. The sand is thus made to act with greater force, cutting much more quickly, and the air or steam blows away the sand as fast as its work is done, and leaves the plate clean so that the workman can see it. Glass signs, glass globes for lamps and gas burners, tumblers, goblets, and other glassware may be engraved in this way very fast and with the most beautiful designs. Metals and stones also may be cut by means of the sand blast, which will not only scratch the surface, but will cut it away to any depth. The marble tombstones put up in the National cemeteries to the memory of soldiers killed in the war were made in this way. Iron letters were fastened on to the smooth face of the stone, which was then put under the sand blast, and the sand cut away all the marble not covered by the letters. When the iron patterns were taken off, the letters were left raised as if they had been cut out with the chisel. The work was done so fast that 300 headstones were made in a day, or as many as 300 men could have done in the same time, working with the hammer and chisel.

Sand-burned, in foundry work, when the heat of the melted metal cast into a mold affects the surface of the sand so as to subject it to a partial fusion, whereby it adheres to and even unites more or less with the surface of the metal, giving a rough result, the casting is said to be sand-burned. This defect is caused by the unsuitable nature of the sand or the want of proper blacking on the mold.

Sandby, Paul, an English painter; born in Nottingham, England, in 1725, where he and his brother Thomas, afterward an architect and R. A., kept a school for some years. In 1741 Paul obtained a post in the military drawing department at the Tower of London; and in 1746–1752 he was draftsman of the survey of the Scotch Highlands, which was one result of the rebellion of 1745. Settling at Windsor, he made some 76 drawings of Windsor and Eton; and he subsequently made a series of drawings of castles in Wales. He was a member of the St. Martin's Lane Academy, of the Incorporated Society of British Artists, and an original member of the Royal Academy, to whose exhibitions he regularly contributed water-color landscapes. Appointed drawing master to the Woolwich Military School, he became famous as a fashionable teacher of painting. His drawings of Scotch scenery were published as etchings by himself, his Welsh views in aquatint; and he was known also as a caricaturist. His water-colors are outlined with the pen, and only finished with color; his perspective is good, and his architectural drawings admirable. He has been called "father of the water-color school." He died in London, Nov. 9, 1809.

Sand Crab, or **Racing Crab,** a genus (*Ocypoda*) of crabs which live in holes in the sand along the sea shores of warm countries. *O. cursor* inhabits the Mediterranean, Red Sea, and Indian Ocean, and is remarkable for the rapidity of its motions.

Sand Eel, in ichthyology, a popular name for the genus *Ammodytes*, and especially for *A. lanceolatus*, called also the greater, to distinguish it from *A. tobianus*, the lesser sand eel. They live in shoals, and are much sought after by fishermen, who discover their presence on the surface

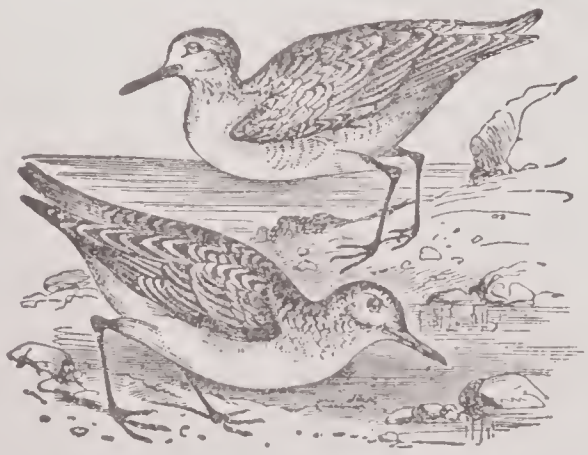
by watching the porpoises which feed on them.

Sandeau, Leonard Sylvain Jules, a French dramatist; born in Aubusson, Creuse, France, Feb. 19, 1811. In his earlier life he succeeded fairly well in literature. After becoming the special friend of George Sand he went with her to Paris in 1831, where they worked and lived together. Their articles were published in the "Figaro" and attracted much attention, adding to the fame of both. Their intimacy came to an end when Sandeau went to Italy in 1833. He returned to Paris in 1834 and resumed his literary work along former lines with excellent success. He was appointed librarian of the Mazarin Library in 1853, and in 1859 he was made curator. He wrote "Marianna" and other novels. With Angier he wrote the comedies "Mlle. de la Seiglière," "The Son-in-Law of Monsieur Poirier," and other plays. In 1858 he became a member of the French Academy. He died in Paris, April 24, 1883. See SAND, GEORGE.

Sandemanians, in Church history, the followers of Robert Sandeman, who in the latter part of the 18th century introduced into England and America the doctrine of the GLASSITES (*q. v.*). The body is not numerous. They have a weekly communion, and dine together every Lord's day, admit new members with a kiss of charity, abstain from blood, wash each other's feet, and each member is bound, to the full extent of his income, to support his Church and the poor.

Sander, *Lucioperca sandra,* a species of fishes belonging to the perch family, and found in fresh-water rivers and streams in Germany and the E. of Europe generally. It attains an average length of three or four feet, and is esteemed as an article of food. It is known under the name of pike perch.

Sanderling, in ornithology, *Callidris arenaria,* described by Saunders as "a Tringa without a hind toe," a winter visitant,



SANDERLING: MALE AND FEMALE.

arriving about the beginning of August and leaving about April. The adult male is about eight inches long, female slightly larger. The summer plumage is somber on the upper surface, edged with red, the whole becoming light ash gray in winter; under surface pure white.

Sanders, Frank Knight, an American theologian; born in Batticotta, Ceylon, June 5, 1861; was graduated at Ripon College, Wis., in 1882; studied Semitic languages and Biblical literature at Yale University in 1886-1889; instructor at Jaffna College, Ceylon, in 1882-1886; Professor of Biblical Literature at Yale University in 1893-1901; Professor of Biblical History and Archæology and dean at the Yale Divinity School in 1901-1905; President Washburn College (Kan.) after June, 1908. His publications include "The Messages of the Earlier Prophets" (1898); "The Messages of the Later Prophets," both with Prof. C. F. Kent; etc.

Sanderson, Robert, an English clergyman; born either in Sheffield or at his father's seat, Gilthwaite Hall, near Rotherham, Sept. 19, 1587. From Rotherham grammar school he passed in his 13th year to Lincoln College, Oxford, of which he became a Fellow (1606), reader of logic (1608), and thrice sub-rector (1613–1616), in the last year being also chosen senior proctor. He had taken orders in 1611, and in 1618 was presented to the rectory of Wyberton in Lincolnshire, in 1619 to that of Boothby-Pagnell, near Grantham, in the same county. In 1631 he was appointed a king's chaplain: "I carry," said Charles I., "my ears to hear other preachers, but I carry my conscience to hear Mr. Sanderson, and to act accordingly." He was created D. D. in 1636; from 1646 to 1648 filled the regius chair of divinity at Oxford; and continued parson of Boothby-Pagnell for upward of 40 years, even (in spite of one imprisonment and frequent plunderings) through all the Great Rebellion. In October, 1660, he was consecrated Bishop of Lincoln, and in 1661 he was moderator of the Savoy Conference; to him are due the present preface to the Prayer Book and the General Confession. He died in his palace of Buckden, Hunts, Jan. 29, 1663. His works, collected and edited by Professor Jacobson (6 vols. Oxford, 1854), comprise, besides sermons, the "Logicæ Artis Compendium" (1615), "De Obligatione Conscientiæ Prælectiones" (1647; new ed. by Whewell, 1851), "Nine Cases of Conscience Resolved" (1628–1678), and "Episcopacy Not Prejudicial to the Regal Power" (1661).

Sand Flies (genus *Simulium*), the name of certain flies found in various countries, the bite of which may give rise to painful swellings. They are included in the family *Tipulidæ,* which also includes the well-known "daddy long legs," or crane flies.

Sand Grouse, in ornithology, the family *Pteroclidæ,* called also rock pigeons

Elegantly formed birds, with pointed tails, and plumage of beautifully varied protective tints. They are preëminently desert birds, and are found in great numbers in the most arid situations and on the most open and barren plains. Their food consists of hard seed and insects. *Pterocles setarius* is the pin-tailed sand grouse, and *Syrrhaptes paradoxus*, Pallas's sand grouse.

San Diego, a city, port of entry, and county-seat of San Diego co., Cal., on San Diego Bay, 120 miles S. by E. from Los Angeles, 432 miles from San Francisco; on the Southern California, the San Diego, Pacific Beach and La Jolla, the San Diego, Cuyamaca, and Eastern, the National City and Otay, and the Atchison, Topeka and Santa Fé railroads. Next to San Francisco, its land-locked harbor is considered the finest on the Pacific Coast. No milder or more uniformly agreeable climate can be found, and this, with its beautiful site and surroundings, has made San Diego one of the most popular health resorts in the United States. It has several good hotels and other accommodations. Here are a State Normal School, United States Custom House, Public Library (Carnegie building), a fine hospital and handsome Court House, Academy of Our Lady of Peace (R. C.), street railroad, electric lighting, National, State, and private banks, several daily, weekly and monthly periodicals, churches, parks, etc.

The industries of the city are growing; besides the fish-catch (a prominent activity) there are machine shops, foundry, salt works, carriage and wagon factories, flour and planing mills, etc., with an invested capital (1900) of $1,147,712, its manufactures for that year amounting to $1,309,321; and the general assessed valuation of property, nearly $12,500,000. The exports in 1900 were $963,000; imports, $512,000.

San Diego is really the oldest municipality in the State, having been organized as a pueblo in 1835, on the basis of the old mission (the first established in California) of 1769. The town was organized in 1846 during the Mexican war, by Commodore Stockton, and in 1867 the modern city began. The present city charter was granted in 1889, and revised in 1901, giving as government a mayor and a bicameral council, with the usual administrative officers. Interesting local features are Fort Rosecrans, the U. S. military station, the quarantine and naval coaling stations, the monument on the Mexican boundary, La Jolla (pron. *Holya*) Cave, Sweetwater Dam, the old San Diego Mission and town, and Coronado Beach, with its ostrich-farm, botanical gardens, etc. Steamers ply regularly to San Pedro (Los Angeles), San Francisco and other places on the coast, and sailing vessels to Pacific ports on both sides of the ocean. Pop. (1890), 16,159; (1900) 17,700; (1910) 39,578.

Sand Lizard, in zoölogy, the *Lacerta agilis*, about seven inches long, of which the tail is four; palatal teeth. Usual color sandy-brown, with obscure longitudinal bands of a darker hue, line of round black spots on side. The female lays 12 to 14 eggs in the sand, covers them, and leaves them to be hatched by solar heat. Common in Northern and Central Europe.

Sand Martin, in ornithology, the *Hirundo riparia*, called also the bank martin and bank swallow; length about six inches; upper parts and a broad band across the breast grayish brown, lower parts brownish white. It makes its nest in the steep banks of rivers, sand pits, quarries, and sea banks, and deposits four or five white eggs. It breeds in N. latitudes, but goes S. in autumn, returning again in spring.

Sand Mole, in zoölogy, the *Bathyergus maritimus*, a rodent from the Cape of Good Hope. It is about the size of a wild rabbit, with light grayish-brown fur, rather variable in tint in different individuals; eyes small; external ears wanting; tail short.

San Domingo. See SANTO DOMINGO.

Sand Pipe or **Sand Gall,** in geology (plural), deep cylindrical hollows in a vertical direction found in England, France, and elsewhere, penetrating the white chalk and filled with sand and gravel. One seen by Sir Charles Lyell at Norwich in 1839 was 12 feet in diameter, and more than 60 feet deep. Mr. Trimmer attributed them to the action of the sea on a beach or shoal; Lyell to the chemical action of water charged with carbonic acid, derived from the vegetable soil and the roots of trees, on the chalk below.

Sandpiper, in ornithology, a popular name for several wading birds. Yarrell enumerates the following: The buff breasted

FIGHTING SANDPIPER.

sandpiper (*Tringa rufescens*), Bartram s sandpiper (*Bartramia longicauda*, formerly *Totanus bartramii*), the eommon sandpiper or summer snipe (*Totanus hypoleucus*), the spotted sandpiper (*Totanus macularis*), the green sandpiper (*Totanus ochropus*), and the wood sandpiper (*Totanus glareola*). In ichthyology, the *Petromzon branchialis*, the larva of which has been long known under the name of Ammocœtes.

Sandringham, a Norfolk estate, 3 miles from the sea and 7½ miles N.N.E. of Lynn, England, comprising over 7,000 acres; was purchased in 1862 by the Prinee of Wales. The then existing mansion was demolished, and the present hall built in 1869–1871, a red-brick Elizabethan eountry house, standing in a pleasant park of 200 aeres; speeial features are the iron "Norwieh gates," the dairy, and the splendid cottages. A fire on Nov. 1, 1891, did damage to the amount of over $50,000. Sandringham was the scene of the six weeks' illness of the Prince of Wales (November–December, 1871), and of the death of his eldest son, the Duke of Clarence (Jan. 14, 1892).

Sands, Benjamin Franklin, an American naval officer; born in Baltimore, Md., Feb. 11, 1811; entered the navy in 1828 as midshipman; was commissioned lieutenant in 1840; served in the Mexican War; cruised off the coast of Africa for the suppression of the slave trade; attached to the Coast Survey, 1851–1859; made commander, 1855; commissioned captain, 1862; and served with gallantry throughout the Civil War, he was made commodore, 1866; appointed superintendent of the Naval Observatory, 1867–1873; commissioned rear-admiral, 1871; and retired, 1874. He died in Washington, D. C., June 30, 1883.

Sands, Henry Berton, an American surgeon; born in New York city, Sept. 27, 1830. He was associated with Willard Parker from 1860 to 1870; was Demonstrator of Anatomy in the College of Physicians and Surgeons, New York, 1856–1866; Professor of Anatomy, 1869–1870, and from 1870 to his death held the chair of surgery. He died in New York city, Nov. 18, 1888.

Sands, James Hoban, an American naval officer; born in Washington, D. C., July 12, 1845; was graduated at the United States Naval Academy in 1863; served in the Civil War with the North Atlantic blockading squadron; was present at the evacuation of Charleston and at the attacks on Fort Fisher. He was assigned to the Indian squadron in 1865, and participated in the skirmish with the savages on the Island of Formosa. In the American-Spanish War in 1898, he served in the North Atlantic patrol squadron; was off Santiago at the time of the surrender of the Spanish army; and joined the expedition to Porto Rico. After the war he became governor of the United States Naval Home in Philadelphia, Pa.

Sands, Robert Charles, an American author; born in Flatbush, Long Island, N. Y., May 11, 1799; in 1824 edited the "Atlantic Magazine," and from 1825 to 1827, with Bryant, the New York "Review"; and from 1827 till his death was on the staff of the "Commercial Advertiser." With Bryant and Verplanck he wrote the "Talisman," an annual, in which appeared the "Dream of the Princess Papantzin," one of his longest poems; he also published the "Life and Correspondence of Paul Jones." He died in Hoboken, N. J., Dec. 17, 1832.

Sand Screw (*Sulcator arenarius*), a species of *Crustacea*, nearly allied to the SANDHOPPERS (*q. v.*), and so named from the tortuous manner in which it exeavates its burrows in the sand.

Sand Star, *Ophiura*, a genus of starfishes belonging to the order *Ophiuroidea*. In the sand stars the arms or rays are mere appendages to the body, and not definite parts, and the viseera or organs of the body do not extend into the rays, but are confined to the central body piece or "disk." The ambulacral system of vessels is not well developed, and does not subserve locomotion to the same extent as in the Asteroidea.

Sandstone, any stone which is an agglutination of grains of sand, whether calcareous, siliceous, or of any other mineral nature. Siliceons sandstones are the most common. They vary in compactness from scarcely cemented sand to a hardness approaching that of quartz rock. The grains may be held together by an iron oxide, or calcareous matter, or by simple pressure. When very fine in grain, they are called freestones; when coarse and composed of angular or subangular grains of sand, they become grits; when pebbly, pudding stones. Loose and friable sandstones do not as a rule preserve fossils well. They are often deeply ripple-marked, and occasionally preserve footprints or the indentations made by old rain drops. Sandstones oceur in nearly every geological formation from the Cambrian to the Tertiary. Many furnish building and paving stones.

Sandusky, a city and county-seat of Erie co., O.; at the mouth of Sandusky river, on Sandusky Bay, an arm of Lake Erie, and on the Lake Shore and Michigan Southern, the Baltimore and Ohio, and other railroads; 56 miles W. of Cleveland. It contains a costly high school building, court house, the State fish hatchery, a public library, waterworks, street railroads, electrie lights. National and other banks, and daily and weekly newspapers. It has a large ex-

port trade in fresh and salted fish, lumber, limestone, coal, iron ore, apples, grapes, and wine. The city is one of the largest fresh fish markets in the world, and is in the heart of a great grape-growing region. Its manufactured articles include carpenters' tools, handles, spokes and hubs, threshing machines, boilers, etc. The assessed property valuation is over $7,000,000. Pop. (1900) 19,664; (1910) 19,989.

Sandusky Bay, a bay in Ohio, projects from Lake Erie between Erie and Ottawa counties; constitutes a fine harbor, in which vessels find safety during storms. On its shore, near the mouth of the Sandusky river, is the city of Sandusky. Its shore in places is made attractive by strips of forest. It is 20 miles long and 5 miles wide.

Sandusky River, a river in Ohio, whose source is near the W. border of Richland county. Its course is W. through Crawford county till it reaches Upper Sandusky, where it turns N. and traverses the counties of Seneca and Sandusky, and flows into the W. end of Sandusky Bay, at Sandusky. It is 150 miles long.

Sand Wasp, the common name of a family of fossorial hymenopterous insects, the *Sphegidæ* of Latreille. There are numerous species, generally large, violet blue, sometimes banded with yellow; the females have a sting; there are no neuters, the female making her own nest in the sand.

Sandwich (so called after John Montagu, 4th Earl of Sandwich, Kent, England, who used to have sandwiches brought to him at the gaming table, to enable him to play without leaving off), two thin slices of bread, plain or buttered, with a slice of meat, as ham, beef, etc., seasoned with mustard, between them; hence, applied to anything resembling a sandwich, *i. e.*, consisting of a person or thing placed between two different things.

Sandwich Islands. See Hawaii.

Sandwich Tern, in ornithology, the *Sterna cantiaca*, first observed in England at Sandwich (whence its popular name), in 1784, by Boys. It is a summer visitant, leaving in August. Wings and back pearl-gray, breast white, head above the eyes black. Length about 15 inches.

Sandy Hook, a low beach at the mouth of New York harbor, about 5 miles long, and varying in width from a few hundred feet to ¾ of a mile. There is a beacon light at the very extreme point, but the Sandy Hook lighthouse is ¾ of a mile to the S. The National government has recently established Fort Hancock here.

Sandys, Edwin, an English clergyman; born in Hawkshead, England, in 1528, and was educated at Cambridge University, where he became master of Catherine Hall and subsequently vice-chancellor of the university. Being a partisan of Lady Jane Grey, he was imprisoned in the Tower; but was liberated at the end of four months, and crossed to Germany. On the accession of Elizabeth he returned to England, and was made Bishop of Worcester in 1559. In 1570 he was translated to London, and thence to York in 1577. He died in Southwell, July 10, 1588. His son, Sir Edwin Sandys (born in Worcester, England, in 1561), was employed by James I. on several missions, received the honor of knighthood, was connected with the Second Virginia Company and otherwise with American colonies, and published "Europæ Speculum, a Survey of the State of Religion in the Western Parts of the World." He died in Northborne, Kent, in October, 1629. Another son, George Sandys (born in Bishopsthorp, England, in 1577), published a "Relation of Travels in the East," a metrical translation of Ovid's "Metamorphoses," metrical paraphrases of the Psalms, Job, Ecclesiastes, Song of Solomon, etc. His poetry is praised by Dryden and Pope. He died in Bixley Abbey, in March, 1644.

Sanfoin (*Hedysarum onobrychis*), a perennial forage plant; native of Europe up to lat. 51°; a legume which has the property of binding light, dry, sandy, and chalky soils by its roots. English and Continental writers agree as to its nutritious qualities for stock, and also to its value as a crop to shade the soil and for plowing under. It has been tried from time to time in the United States, both N. and S., but has not met with favor in any locality. In the N. the winter kills it, as it does in the W. In the Middle States it can not compete with clover, and in the S. it is reported to be feeble in growth.

Sanford, Edward, an American author; born in Albany, N. Y., July 8, 1805. Included in his best-known works are a poetical address to Black Hawk, and "The Loves of the Shell Fishes." Many of his verses, which are graceful and humorous, have been published in various collections. He died in Gowanda, N. Y., Aug. 28, 1876.

Sanford, Henry Shelton, an American diplomatist; born in Woodbury, Conn., June 15, 1823; was educated at Trinity College, Hartford, Conn., and at the University of Heidelberg; was secretary of the United States legation in Paris in 1849–1853 and United States minister to Belgium in 1861–1869. During his latter incumbency he negotiated the Scheldt Treaty, a trade-mark, a treaty of navigation and commerce, and a naturalization convention between the United States and Belgium. In 1877 he took part in the founding of the Independent State of the Kongo, under the

San Francisco

name of the International African Association, and in 1884, as its plenipotentiary at Washington, received recognition of its independence by the United States government. He also represented the United States at the Berlin Kongo Conference of 1885-1886, which granted free trade and neutrality to a population of 50,000,000 people, inhabiting 1,000,000 square miles of territory. Mr. Sanford established the city of Sanford, Fla., in 1870. He introduced into that State the new culture of the lemon besides that of several other fruits. A number of his official reports, including "Penal Codes of Europe" and "Averdslood Correspondence," were published by Congress. He died in Heating Springs, Va., May 21, 1891.

San Francisco. The principal city of California and the commercial center of the Pacific Coast, in lat. 37° 47′ 55″ N. and long. 122° 24′ 32″ W., is situated at the northern end of a long, narrow peninsula that encloses the bay of San Francisco, separating it from the Pacific Ocean. The city is built on fourteen sand hills, three of which on the north are of local as well as topographic interest, Telegraph Hill, Nob Hill and Russian Hill. It faces the bay to the E., extends W. to the ocean and S. to the San Bruno hills, covering an area of 46½ square miles. The picturesque channel or strait, known as the Golden Gate, 1 mile wide and 6 miles in length, connecting the bay with the ocean, separates San Francisco from the opposite promontory on the N. The Golden Gate leads from the ocean into the harbor of San Francisco, said to be one of the finest in the world, the bay itself being 65 miles long and averaging 12 miles in width. The city and harbor are overlooked by Mt. Tamalpais (2,500 feet) that rises steeply from the bay on the N. promontory, and slopes gently on the W. side toward the ocean. Across the bay lie the city of Oakland, a residence suburb of San Francisco, and other suburban cities, with San Rafael on the N. promontory. "Few places," says James Bryce in his "American Commonwealth," "can vie with San Francisco, either in beauty or in the natural advantages of her situation. Indeed, there are but two places in Europe—Constantinople and Gibraltar—that combine an equally perfect landscape with what may be called an equally imperial position."

Local Features.—The E. portion of the city, facing the bay, is on made ground, but the N. and W. portions, being uneven and hilly, required much grading to make them suitable for business and traffic. The finest residential sections, however, are in the elevated portions of these districts. From the summit of Nob Hill (300 ft.) a magnificent view is obtained, and also from Twin Peaks (925 ft.) in the S. W. Market street, the principal thoroughfare, intersects the city diagonally for a distance of 3½ miles, running S. W. from the Ferry Building on the bay to the Twin Peaks. The named streets N. of Market are laid out rectangularly and intersect it at acute angles, while the numbered streets S. of it run mostly parallel and across Market street until the ground slopes down toward the bay in the S. E. commercial district, where the streets are laid out more or less rectangularly to conform to the surface of the land. The center of the shopping district has, since the fire of 1906, been transferred to Grant avenue, Geary, Post, and Sutter streets. A project is on foot to still further beautify the city by widening and extending Geary street, and grading a wide avenue to the summit of Nob Hill, and prolonging the E. extension or "panhandle" of Golden Gate Park as far as the bay, so as to form a parkway across the city.

Climate.—The mean temperature of this section is, in July, 59.5°; in January, 46.1°; the average throughout the year being 56°—57°. Frost and snow are rarely experienced. There is a "rainy season" from October to early April, the heavy rains, however, being only in December and January. Observations during 30 years showed the annual rainfall to be about 25 inches, and sometimes less, and the average number of actual rainy days to be 70. There are usually a few hot days (80°—90°) in midsummer, and a very rare frost in January, but these are unusual extremes. On the hottest days, the afternoon sea breeze cools the air, and as it also brings fog, and in parts of the town blows up sand, wraps are always needed. The average of foggy days during the year is 66 per cent. Slight earth tremors had been felt in San Francisco in various years, but except in 1868, when one life was lost, had attracted little attention until the catastrophe of 1906.

Parks.—There are six large parks and a number of smaller parks and squares, all kept in excellent condition. Golden Gate Park, the largest (1,013 acres), situated amid the sand hills in the central W. portion of the city, extends W. to the ocean and is a wonderland of verdure, choice trees, and shrubs and beautiful semi-tropical plants and flowers, with artificial lakes and attractive Japanese tea-gardens, and enclosures for deer, bears and buffalo. There is also the Memorial Museum and Art Gallery on Strawberry Hill, a picturesque Observatory, and a Prayer Book Cross, commemorating the arrival of Sir Francis Drake in the bay and the first Church of England service on the shore, in 1578. In a small park separating Chinatown from Kearney street stands the beautiful monument to Robert Louis Stevenson, a golden galleon, while in Union Square is a more imposing monument to commemorate the achievements of the United States Navy in the Spanish war of 1898.

San Francisco

Fortifications, etc.—N. of Golden Gate Park, beyond the Richmond district and directly overlooking the Golden Gate, is the Presidio, or United States military reservation of 1,480 acres, with the officers' quarters and the military hospital and barracks, and here also are the harbor fortifications with their heavy rapid-fire machine guns.

Port of San Francisco.—Since the earthquake and fire about $5,000,000 has been spent on extension improvements and repairs to the port of San Francisco, whose business was stimulated by the disaster. It is said by expert engineers that the construction of the new pier, built of stone and concrete, is unrivaled in any city in the world. The harbor is the only secure deep-water one between San Diego and the Columbia river. There is also a large stone dry dock and a floating dock.

Water Supply.—This has hitherto been controlled by private interests, the Spring Valley Water Company, which has had the monopoly of the San Francisco water supply for forty years. The supply proved inadequate at the time of the fire, and ever since then efforts have been made to obtain water rights in the Hetch Hetchy Valley. These efforts met with great opposition, partly from an æsthetic point of view, but finally on Jan. 15, 1910, at a special election and by a vote of 32,876 to 1,607, San Francisco authorized a bond issue of $45,000,000 for the acquisition of reservoir sites at Lake Eleanor in Hetch Hetchy Valley in the Sierras, with the sanction of the United States Government, and also for a comprehensive distributing system for a municipal water supply. A proposition to issue $35,000,000 bonds to purchase the Spring Valley System was lost by 1,234 votes.

Buildings.—The greatest change, since the disaster, may perhaps be seen on Market street, the Broadway of San Francisco, a mile and a half of which was destroyed by the fire, only the shells of a few big office buildings remaining between the Ferry depot, which escaped, and Van Ness avenue. The Flood Building, the Claus Spreckels Building, and the Chronicle Building, in Newspaper Row, were restored without delay. A number of handsome new bank and office buildings now line this great business thoroughfare. Four new structures occupy the entire block on the S. side between Fourth and Fifth streets, of these the Emporium Building alone having been rehabilitated. The finest structure on Market street is, however, the Phelan building, erected at a cost of $2,000,000. Rents in this building in 1909 were at the rate per month of $70 a front foot. Almost similar rents obtain in the new retail dry goods district, formerly the site of cheap stores with cellar concert halls. Another great change is in the old Irish tenement district S. of Market street, known as Tar Flat. This was formerly covered with thousands of cottages and two-story frame houses, inhabited largely by factory and mill hands and their families and by shipyard employees. These were all driven out by the fire and settled in the Mission district. As the fire ordinance prohibits the rebuilding of wooden structures, many blocks are here lying idle, though some factories and business plants have invaded the district. In the old banking and insurance district, a change is seen in the line of handsome buildings. The Bank of California has rebuilt on the same site at California and Sansome streets, the most beautiful business building since the fire, being of white granite in classic style of architecture. The Alaska Commercial Company has erected a handsome building on the opposite side of Sansome street. With the exception of the First National Bank, which has built a splendid granite structure at the corner of Montgomery and Post streets, and the San Francisco Savings Union, which has erected a granite building, solely for its own use, at the N. E. corner of Market street and Grant avenue, the banks and insurance companies have nearly all rebuilt on their former sites. Various Federal buildings are being constructed by the government: a custom-house, post-office and sub-treasury, which with the work in the navy yard and on docks and warehouses for the transport service will cost more than $5,000,000. The Palace Hotel, which was completely destroyed by the fire, has been rebuilt on a more sumptuous scale, and the St. Francis and Fairmont Hotels restored, and these with many others furnish accommodations unsurpassed in any city in the United States.

Charities.—There are 200 charitable institutions, with a number founded and maintained by private beneficence, such as the Bishop Armitage Church Orphanage, the Maria Kipp Orphanage, Pacific Hebrew Orphan Asylum, the Youth's Directory and the Crocker Home for the Aged. At least twelve societies are doing preventive and rescue work, and the Associated Charities of San Francisco is effective in giving outdoor relief.

Educational Institutions.—First in importance, probably, are the 98 graded public schools and three high schools with an attendance of about 60,000. Various affiliated colleges and professional schools of the University of California, whose seat is at Berkeley, across the bay, as well as those of Leland Stanford Jr. University at Palo Alto, 30 miles S. of the city, are in San Francisco: also Roman Catholic parochial schools, the Polytechnic School, the California School of Mechanical Arts, and other private institutions, besides a large number of kindergartens. In this connection may be mentioned the unusual number of

literary and scientific societies in San Francisco, nearly all of which have fine libraries, and of special interest are the Geographical Society of California and the California Historical Society.

Manufactures.—According to a bulletin of the Bureau of the Census (1905), San Francisco had 2,251 manufacturing establishments belonging to the new factory-system classification (excluding small shops, hand trades and individual artisans) which employed $102,362,378 capital and 38,429 wage-earners; paid $25,015,427 wages, $12,474,338 for miscellaneous expenses, and $75,945,898 for materials used in manufacturing; and had aggregate products valued at $137,788,233. The principal industries in the order of output were: Foundry and machine shop products, $8,991,449; slaughtering (wholesale), not including meat packing, $6,694,497; printing and publishing (newspapers and periodicals), $5,575,035; bread and bakery products, $4,882,199; canning and preserving fruits and vegetables, $4,151,414; malt-liquors, $4,106,034; coffee and spice (roasting and grinding), $3,979,865; flour and grist mill products, $3,422,672; and book and job printing, $3,849,459.

Commerce.—The unique position of San Francisco—on its bay with unequaled harborage, and central on the Pacific coast-line of North America—has given the city the opportunity for its great importance, which has been utilized by courageous enterprise. Its great wharves and warehouses offer conveniences for its coastwise trade from north and south, its interior traffic by rail with all the United States, and its Pacific sea trade with the Hawaiian and Philippine Islands, Japan, China, Australia, Central and South America, with all which lands it has direct steamship connection, as well as making great shipments of grain and other products by sailing vessels to Europe.

The influence upon California and the Pacific coast of the opening up of the Philippines and the creation of new markets in all the Oriental possessions that border the Pacific Ocean, as well as in Australia and the South Sea Islands, has already begun to be felt. This is shown by the increase of trade, by the new commercial and industrial enterprises which have been begun, by the increase in population in San Francisco, in Los Angeles, in Portland, in Seattle and other large cities of the coast; and, more than all, by a new cosmopolitan spirit which has succeeded to the old provincial methods that were born of long isolation from the East and the rest of the world. In close touch with all the great Pacific Ocean empire by steamship lines and by new cable systems, the Pacific Coast States are fairly on the road to the vast development marked out for them by climate and geographical position. And at the center of this new activity, at the natural gateway of the richest trade of the Orient, stands San Francisco, looking out from her many hills upon the noblest bay in the world.

Throughout the Orient the most significant feature of recent trade is the great demand for American manufactures, especially in machinery, electrical apparatus and locomotives and railway material. Large orders for electric power plants have been filled in San Francisco for Seoul, Korea, and Mysore, British India, while from Siam, and even the Dutch East Indies, have come extensive orders for American machinery. The same thing is true in regard to Australia, which is a large buyer every year of a line of Pacific coast manufactures peculiarly adapted to the climate and soil of the great island continent. Japan, now that her long expected and splendidly conducted struggle with Russia is over, will more keenly than ever devote herself to the upbuilding processes of industry and commerce; and, although Great Britain runs as closely, the United States stands with Japan, commercially, if not in diplomatic language, in the position of "the most favored nation."

In the calendar year 1910 the imports of merchandise at this port aggregated in value $50,649,435, and the exports, $36,413,739; of gold and silver ore, bullion and coin, the imports were $6,452,607; exports, $9,457,967; gold leading in imports and silver in exports. The total foreign trade of the year was valued at $102,973,748.

Banking.—According to the annual report of the Comptroller of the Currency for the banking year ending Sept. 1, 1910, there were 10 national banks in the city, having a combined capital of $27,250,000; surplus, $15,630,000; circulation, $18,630,345; individual deposits, $82,478,735; and total resources, $208,807,484. San Francisco in 1910 ranked seventh among the clearing house cities of the country, the aggregate exchanges being $2,268,678,600, an increase of $360,360,700 in a year.

Finances.—On Oct. 1, 1910, the total bonded debt was $16,314,500; sinking fund, $24,456, making a net debt of $16,290,044. At the same time the city and county of San Francisco owned property valued at $34,433,890. The assessed valuations for 1910-11 were: Real estate, $433,263,243; personal, $81,763,921; total, $515,027,164. The tax rate was $20 per $1,000, and the amount of taxes levied in 1910-11 was $8,482,497, for city and county purposes, and $10,300,543 for State purposes.

The Great Disaster of 1906.—In 1905 the city was at the height of its prosperity. On April 18, 1906, shortly after 5 A. M. occurred the memorable earthquake which resulted in one of the most disastrous fires that has ever laid waste a city. While the inhabitants were still dazed by the shock of the earthquake and the sight of falling

walls and chimneys, the hoarse cry of fire was heard, and before 6 A.M. twenty distinct columns of smoke were seen ascending in various directions. The earthquake, though it lasted only a little over a minute, had broken the mains of the Spring Valley Water Company, and where the main conduit was over an old wooden trestle built on made and filled in ground the greatest damage was wrought. This emergency had been foreseen and dynamite and the use of waters from the bay were resorted to, all the engine facilities of the harbor being called into requisition. Unable to quench the flames, the firemen, aided by 600 police, sought to maintain order until the arrival of the troops from the Presidio. In the absence of Maj. Gen. A. W. Greely, Gen. Frederick Funston took command, placed his small garrison of 1,700 men under arms, and shortly after 6 A.M. the business section of the city was being patrolled by United States soldiers. Mayor Schmitz nominally placed the city under martial law, to prevent looting, but no case is recorded of its being put into effect, although the militia killed two men, and another (Maj. Tilden) was shot by so-called Vigilantes. The fire raged for three days, after sweeping over a triangular area of about 5 square miles, comprising more than 450 street blocks and extending from the bay front, W. to Van Ness avenue and S. W. nearly to the Dolores Mission, and S. from the N. harbor front to the China Basin and the Coast Line Station of the S. Pacific Railroad. The total loss, including property not covered by insurance, was variously estimated at from $500,000,000 to $1,000,000,000. The total insurance carried by the city at the time was $300,000,000. The loss of life was estimated at 500. Mayor Schmitz appointed a committee of fifty leading citizens, with various sub-committees, the most important being the Finance Committee, to consider ways and means, James D. Phelan being at its head. Its movements were, however, hampered by the mayor's proclamation closing all the banks and savings institutions for a period of thirty days. The Finance Committee of Relief and Red Cross funds was re-enforced by the addition of members selected by the California Branch of the National Red Cross. President Roosevelt sent Dr. Devine of New York as special representative of the National Red Cross in charge of the Relief Fund. On the retirement of the army from relief work Dr. Devine was appointed chairman of the General Relief Commission. The total net receipts of the Relief Fund up to Nov. 12, 1906, were $6,204,993; expenditure, $4,443,588; balance remaining, $1,761,405. The total subscriptions from all sources were estimated at $9,129,553.

History.—The Franciscan monks, when establishing missions for the conversion of the Indians in this part of California, discovered and named the Bay of San Francisco in 1769, and seven years later (1776) a small party of soldiers and settlers with their families took possession of the present site of the city, under orders from Bucareli, Viceroy of Mexico, setting off a presidio, or military reservation, building an adobe fort, founding a pueblo or town, and establishing a mission—the Mission Dolores. The narrow peninsula not allowing the four square leagues specified by Mexican law for a pueblo settlement, the equivalent space was taken in length for the pueblo of Yerba Buena. Its course was uneventful until in 1846 the United States took possession, during the war, and in 1847 the town was named for the bay—San Francisco. The presence of naval and miltary forces drew some small income of settlers, and for a couple of years the alcalde, or presiding magistrate, was an army appointee. During 1848, when the inhabitants numbered 459, there was an attempt at electing a town council of 6; but it was on January 19, 1848, that gold was discovered on Sutter's Creek, and as soon as the news reached San Francisco the place was deserted: it is said that there were but 5 men left. Very soon, however, the tide of gold-seekers began to arrive by sea, and trade quickly filled the empty spaces. The town grew rapidly, but its government was crude and corrupt. In November, 1849, the people of the State had made and adopted a constitution; but the wrangle in Congress as to whether it should come in as a free or a slave State (the former being the choice of the Californians) delayed its admission until Sept. 9, 1850. When the news arrived by steamer, Oct. 18, the people went "half wild with excitement and joy." By this time the State had a population of 92,597, and San Francisco from ten to twelve thousand. On April 15, 1850, a charter was granted, and the city began a more orderly procedure.

But the wild rush for gold which within two years had brought over 80,000 people to the State (and in 10 years more, 1860, had increased her population to 379,994), had attracted but few women or families: the great proportion was of men—and largely, men hungry for gain, many of bad character, ex-convicts from Australia, and similar classes. Therefore it was not unnatural that the early municipal councils should have proceeded to loot the city treasury, by absurdly high salaries and other corrupt practices, nor that vice and crime should increasingly prevail. By 1851 the population was 25,000, and the city debt $1,000,000: the courts were corrupt, the lawless characters in the ascendant, when the decent men formed a Vigilance Committee, and, both in 1851 and 1856 arrested, tried, convicted and executed criminals without regard to the courts. In 1851 a new charter was obtained

San Francisco

from the legislature, and matters were bettered, but for five years the struggle between order and disorder was a fierce one, order finally prevailing.

The rapid building up of the town was necessarily in slight material, and destructive fires prevailed, one in 1849, two in 1850, and two in 1851, the value in property consumed having been $16,000,000. In 1856 the city and county of San Francisco were consolidated in government, as they had been coterminous in territory, and gradually municipal affairs became regulated. There was a decided but probably wholesome setback commercially in 1854, due to rash speculation and a falling off in the products of the mines; but meanwhile the agricultural wealth of the State had begun to be developed, and the city received its benefits from that, as a distributing center, so that by 1858 affairs were again moving smoothly, and in and after 1860 the colossal growth of fortunes from Nevada silver mines, owned chiefly in San Francisco, made a new source of prosperity. Even this was augmented later—outside of the natural enlargement by commerce and trade—in the vast returns of San Francisco men who promoted the systems of transcontinental railway communication.

San Francisco had long been the prey of politicians, but in 1894, with the organization of the Merchants' Association, civic conditions began to improve slowly. The streets, sewers, and schools had been scandalously neglected, in fact, everything seemed to be as bad as it could be, and even the taxpayers were discouraged, when a small number of business men (47) formed an association to better conditions and to arouse public spirit. It took up minor matters at first, such as street cleaning, and worked in harmony with the city officials, but found that no permanent reform was possible under the Consolidation Act, and those interested in the city's welfare saw that this act must be abolished and a charter substituted, of which official responsibility should be the keynote.

The first charter submitted was not satisfactory, but the second, with the ostensible backing of the Charter Committee and the solid support of the Merchants' Association, which had greatly increased in membership, was ratified by the voters of the city on May 26, 1898, approved by the California Legislature on Jan. 26, 1899, and went into effect Jan. 8, 1900. It placed the responsibility and power of the municipal government in the hands of the mayor. For the first three and a half years things worked smoothly, then it became evident that the charter would not bring about the conditions the best elements of the community desired.

The mayor (Phelan), who had the overwhelming support of the people for a second term, had antagonized the greater part of the press, and his errors were magnified, for, though his intentions were mainly good and he appointed good men to office, he had become politically ambitious and sometimes indiscreet. This may have helped to elect the Union Labor candidate Eugene Schmitz, whose friend, Abraham Ruef, had started the Independent Union Labor party. Although not specially fitted for the office Schmitz was re-elected for the third time against a Fusion ticket of the conservative forces, the Phelan Democrats and the merchant Republicans, who were not strong enough for the railroad, the public corporations, the firms seeking city contracts, the "tenderloin," the saloons, and the entire Labor Union interests, that were back of Schmitz. The prosperity of the city deceived the voters, and no appeal to race or class prejudice was omitted. Voting machines were used for the first time, and ignorant voters not understanding how to split the ticket, the result of the elections was a landslide for "Labor." It was the bitterest and most personal campaign that had ever occurred in San Francisco. The Union Labor machine was now a veritable Tammany. Corruption was unrestrained. Ruef was the real boss. San Francisco was stricken and helpless.

This was the state of affairs when Rudolph Spreckels undertook a rigid investigation of the charges of corruption and graft, at his own expense. He employed Detective Burns and Attorney Francis J. Heney, and the first result of their labors was the indictment of former Mayor Schmitz for extortion in office, his conviction and imprisonment, late in 1906. In 1908 Abraham Ruef, the former political boss, was tried on charges of graft and, on conviction, was sentenced to 14 years' imprisonment. During his trial Attorney Heney was shot by a juror whom he had exposed as an ex-convict at a previous Ruef trial. Ruef did not begin his 14-year-sentence until March, 1911, after a prolonged fight in the courts. Amendments to the city charter have since been made (21 in 1907), with a view to preventing frauds at elections and corruption in office and the initiative and referendum has been adopted.

In 1877 a labor agitation against the Chinese, at the instigation of Denis Kearney, resulted in the Chinese Exclusion Act. A sentiment had also arisen against the Japanese, particularly against admitting them to the public schools, and this was encouraged by the action of the public school authorities in attempting a segregation of pupils. This action excited much indignation in Japan. The matter was settled by Congress (1907) by making certain amendments to the immigration laws, but not specifically referring to the Japanese.

After a sharp competition with New Orleans, San Francisco was selected by Congress early in 1911 as the seat of an international exposition to commemorate the official opening of the Panama Canal, scheduled for Jan. 1, 1915. Citizens pledged for the exposition $7,500,000, and the Legislature and municipal government authorized an appropriation of $5,000,000 each.

Population.—(1870) 149,473; (1880) 233,959; (1890) 298,997; (1900) 342,782; (1910) 416,912.

San Francisco Bay, a land-locked arm of the Pacific Ocean, on the coast of California. It is the finest bay on the W. coast of the United States; is connected with the Pacific Ocean by a strait called the Golden Gate; extends S. by S. W.; washes the shores of Alameda and Contra Costa counties; and reaches from Sonoma county to Alviso. Including San Pablo at its N. point, it is 55 miles long. It varies in breadth from 3 to 12 miles. The shores of the Golden Gate are bold and rocky, rising on the N. to nearly 200 feet; on the S. the hills are sand-covered, 300 to 400 feet high. The bar has a depth of 30 feet of water at low tide; within it is much deeper. There are several islands, including Alcatraz, 4 miles from the entrance, Angel, and Yerba Buena, or Goat. The entrance is defended by fortifications on Alcatraz Island and Fort Point S. of the Golden Gate. The bay is connected N. by a strait, 3 miles wide, with San Pablo Bay about 10 miles across and nearly circular, and this again is connected by Carquinez Strait, 1 mile wide, with Suisun Bay, 8 miles long and 4 miles wide. Both these bays are deep, but Carquinez Strait has only 16 feet of water at low tide. The bay is large enough to float all the navies of Europe at once.

San Francisco Mountains, the loftiest mountain group in Arizona, somewhat N. of the central part, on the Colorado plateau. The highest summit is Challender Peak, 12,794 feet, and second in rank is San Francisco Mount, 12,562 feet, which is capped by a volcanic cone and from the summit of which more than a hundred craters of extinct volcanoes are said to be visible. Volcanic action throughout this group is also evidenced by lava on the peaks.

Sanfuentes, Salvador, a Chilean poet; born in Santiago, Chile, Feb. 2, 1817. Among his works are: "Caupolican," a drama in verse (1835); "El Campanario" (1838); "Teudo: or Memories of a Solitary" (1858); and "Chile, from the Battle of Chacabuco to that of Maipo" (1850). He died in Santiago, July 17, 1860.

Sanga, See Galla Ox.

Sangallo, Antonio da, "The Elder," an Italian architect and military engineer; born in 1450. He was the brother of Giuliano da Sangallo and like him was employed on many important public works, in the execution of which he gained great distinction. He took part in the defense of Florence during the siege of 1530, and died in 1534.

Sangallo, Antonio da, "The Younger," an Italian architect; born near Florence in 1485. He was the son of Giuliano Sangallo, succeeded his master Bramante as architect of St. Peter's in Rome, and was much employed under the Popes Leo X., Clement VII., and Paul III., both in fortifying places and in the construction of public buildings, the grandeur and solidity of which have been much admired. He died in 1546.

Sangallo, Giuliano da, an Italian architect, military engineer, and sculptor, born in Florence in 1445. During the early part of his life he worked chiefly for Lorenzo the Magnificent, for whom he built the fine villa at Poggio a Cajano, where Lorenzo and his learned friends were accustomed to meet. He also built the church of Madonna delle Carceri at Prato, designed for Pope Alexander VI. the beautiful paneled ceiling of Sta. Maria Maggiore in Rome, was employed by Pope Julius II. on many important works, and for a time (1514-15) was joint architect with Raphael of St. Peter's, for which in 1503 he had designed the first plans, though Bramante (*q. v.*) supplanted him. He died in Florence, Oct. 20, 1516.

Sangamon River, a river in Illinois, formed by the North and South Forks, the former being the main branch. Its source is near Gibson, whence it traverses Champaign county, where it turns W. and crosses Sangamon county, and forms the N. boundary of Cass county. It flows into the Illinois river about 9 miles above Beardstown, and 45 miles W.—N. W. of Springfield. Its length is 225 miles, including the North Fork. The Forks join 6 miles E. of Springfield.

Sangay, or **Sangai,** a volcano of Ecuador in the Cordillera de los Upanos, a spur of the Andes; just S. of 2° S. lat. and 120 miles S. of Quito. It is in constant activity; height about 17,464 feet.

Sangerhausen, a town in the province of Saxony, Prussia; on the Gonna, 36 miles W. of Halle and 33 miles N. W. of Merseburg. The local industries include an iron-foundry, machine-shops, and manufactures of stoves, vinegar, gypsum, footwear, tile, and various iron and steel products. There is a fine basilica, restored in 1893. Pop. (1900), 12,077.

San German, a town of Porto Rico; 35 miles S. W. of Arecibo and not far from the coast. It is a picturesque old place, located in the midst of a fertile agricultural section. Pop. (1899), town, 3,954; municipal district, 20,246.

San Gil (or **San Jil**), a town of Colombia; in the Department of Santander, on the right bank of the Gil river, 150 miles N. E. of Bogotá. Sugar-cane, tobacco, and cotton are grown, and straw hats are among the manufactured products. Pop. about 10,000.

Sangir Islands, a group of about 50 islands in the Malay Archipelago between Celebes and the Philippines. The geological formation is volcanic, and on Great Sangir, the northernmost and largest of the islands (about 308 square miles), is the active volcano of Abu. In 1812 this peak, about 4,000 feet in height, burst into violent eruption, devastating the northern part of the island, previously occupied by well-tilled plantations, and causing great loss of life. In 1856 and 1892 other severe eruptions took place, with similar results. The staple article of agriculture and commerce is cocoanut-oil, but rice, pisang, and sago are also extensively grown. Edible (swallows) nests are also gathered for the market. The native inhabitants are Malays, who were originally Moslems, but were converted by the Portuguese in the 15th century to the Christian faith. The Sangirs are governed from the Dutch residency of Menado, Celebes. Pop. (with Talauer Islands) est. (1895), 113,467.

Sanger, Joseph P., an American military officer; born in Detroit, Mich., May 4, 1840. He served with distinction in the Civil War, rising to the rank of brevet major in 1865; commanded a battery in the Brooklyn "Whisky Riots" in 1871; was Professor of Military Science and Tactics at Bowdoin College in 1872-1875; member of the Military Commission on Inspection of Foreign Armies and Equipments in 1875-1877; and recorder of the Army Equipment Board in 1879. He was appointed a Brigadier-General of Volunteers in 1898; was assigned to command the District of Matanzas, Cuba, in July, 1899; and was made Director of the Census of Cuba and Porto Rico in 1899, and of the Philippines in 1902.

Sanger, William Carey, an American statesman; born in Brooklyn, N. Y., May 21, 1853; was graduated at Harvard University in 1874, and at the Columbia University Law School in 1879; was a prominent member of the National Guard of New York; lieutenant-colonel of the 203d United States Volunteers in the Spanish-American War; and was assistant Secretary of War in 1901-03.

Sangrealis, Sangreal, or **Saint Grail,** the Holy Cup or Grail, said to be from Modern Latin *gradale*, a cup; but supposed by some to be a corruption of the Old French *le Sang Real*, *i. e.*, the true blood of Christ. This sacred relic, preserved in an emerald cup, is said in legendary history to have been brought to England by Joseph of Arimathea. According to the romantic story of King Arthur it could only be discovered by one possessed of perfect virtue; and the "Quest of the St. Grail" by the Knights of the Round Table, of whom the perfect champion, Sir Galahad (in other legends Perceval) was favored by its discovery, is narrated therein at great length.

Sangster, Charles, a Canadian author; born in Kingston, Ont., July 16, 1822. He was editor of the Amherstburg "Courier" (1849), and published "The St. Lawrence and the Saguenay, and Other Poems" (1856), and "Hesperus: Poems and Lyrics" (1860). He died in 1893.

Sangster, Margaret Elizabeth (Munson), an American poet; born in New Rochelle, N. Y., Feb. 22, 1838. She was editorially connected with "Hearth and Home" (1871-1873) and "The Christian at Work" (1873-1879); and in 1889 became editor of "Harper's Bazar." Her most noted poems are: "Our Own"; "The Sin of Omission"; and "Are the Children at Home?" Among her books for girls are: "May Stanhope and Her Friend," and "Maidie's Problem"; "Little Knights and Ladies"; etc.

Sanguinaria, a genus of plants, order *Papaveraceæ*. The most interesting species is *S. canadensis*, the puccoon, a native of North America. Its root, often called blood-root, from its containing a red juice, is used internally in large doses as an emetic and purgative, and in small doses as a diaphoretic and expectorant. When applied externally, it is said to exhibit marked escharotic properties, and it has been tried combined with chloride of zinc as an application to check cancerous growths.

Sanguisorbaceæ, in botany, sanguisorbs; an order of perigynous exogens, alliance *Rosales*. Herbs or undershrubs, sometimes spiny. Leaves simple, lobed or compound alternate, with stipules; flowers small, often capitate, sometimes with separate sexes; calyx with the tube thickened and lined with a disk, the limb three-, four-, or five-lobed; stamens definite; ovary solitary, simple, with the style from its apex or its base; stigma compound or simple; fruit a one-seeded nut inclosed in the indurated calyx. Found in Europe, America, and at the Cape of Good Hope. Known genera 12, species 125.

Sanhedrim, or **Sanhedrin,** the supreme national tribunal of the Jews, established at the time of the Maccabees, probably under John Hyrcanus. It consisted of 71 members, and was presided over by the Nasi ("prince"), at whose side stood the Ab-Beth-Din ("father of the tribunal"). Its members belonged to the different classes of society; there were priests (Gr. *archiereis*), elders, that is, heads of families, men of age and experience (Gr. *presbyteroi*); scribes, or doctors of the law (Gr.

grammateis); and others exalted by eminent learning — the sole condition for admission into this assembly. The presidentship was conferred on the high-priest in preferenee, if he happened to possess the requisite qualities of eminence; otherwise, "he who exeels all others in wisdom" was appointed, irrespeetive of his station. The limits of its jurisdiction are not known with certainty; but there is no doubt that the supreme deeision over life and death, the ordeal of a suspeeted wife, and the like criminal matters were exclusively in its hands. Besides this, however, the regulation of the saered times and seasons, and many matters eonneeted with the *cultus* in general, exeept the saeerdotal part, whieh was regulated by a special court of priests, were vested in it. It fixed the beginnings of the new moons; interealated the years when necessary; watehed over the purity of the priestly families, by earefully examining the pedigrees of those priests born out of Palestine, so that none born from a suspieious or ill-famed mother should be admitted to the saered service; and the like.

By degrees the whole internal administration of the eommonwealth was vested in this body, and it beeame necessary to establish minor courts, similarly composed, all over the eountry, and Jerusalem itself. Thus we hear of two inferior tribunals at Jerusalem, eaeh of them eonsisting of 23 men, and others eonsisting of three men only. These courts of 23 men (Lesser Synedrion), however, as well as those of the three men, about both of which Josephus is silent, probably represents only smaller or larger committees chosen from the general body. Exeluded from the effice of judge were those born in adultery; men born of non-Israelite parents; gamblers; usurers; those who sold fruit grown in the Sabbatical year; and, in individual eases, near relatives. All these were also not admitted as witnesses. Two scribes were always present, one registering the eondemnatory, the other the exeulpatory votes. The mode of proeedure was exceedingly eomplicated; and sueh was the eaution of the court, espeeially in matters of life and death, that capital punishment was pronouneed in the rarest instanees only. The Nasi had the supreme direction of the court and convoked it when neeessary. He sat at the head, and to his right hand was the seat of the Ab-Beth-Din; in front of them the rest of the members took their plaees according to their dignity, in a semicirele.

The court met on extraordinary oeeasions in the house of the high priest; its general plaee of assembly, however, was a certain hall (*Lishcat Hagaziz*), probably situated at the S. W. corner of one of the courts of the temple. With exception of Sabbath and feast days it met daily. The politieal troubles foreed the Sanhedrim (70 B. C.), to change its meeting place, which was first transferred to eertain bazaars (*Hannyoth*) at the foot of the temple mount. After the destruetion of the temple and Jerusalem it finally established itself, after many further emigrations, in Babylon.

The question as to the origin and development of the Sanhedrim is a diffieult one. It is said it was intended to be a faithful reproduction of the Mosaic assembly of the 70 (Moses himself making 71). supposed to have been reëstablished by Ezra after the Exile. There are widely different opinions respeeting the jurisdiction and competenee of the Sanhedrim at the time of Christ and the apostles. It has even been questioned how far, save for a few matters of small importance, it may be said to have existed at all, eurtailed and eircumseribed as it was by the Romans, who seem to have reeognized only the "high priest." Nor is it agreed whether it was really from the Sanhedrim at all some of those well-known aets reeorded in the New Testament had their origin; and it is difficult to aecount, by what we know of its eonstitution, for many of the proceedings against the apostles aseribed to this body.

Sanhita, the name of that portion of the Vedas, or sacred writings of the Brahmans, which eontains the mantra or hymns.

Sanitation, that department of human knowledge which regards the laws of the human body, and of the agents by which it is surrounded, with a view to the preservation of health and the warding off of disease and death. The praetical applieation of these laws eonstitutes hygiene, or the art of preventing disease. This is eommonly divided into public and private hygiene, the former having regard to the healthy eondition of persons in eommunities, in camps, barracks, work-houses, ete.; the latter to the health of individuals.

Sanitary Commission. See UNITED STATES SANITARY COMMISSION.

San Jacinto, Battle of, a notable battle that deeided the independenee of Texas. It was a desperate engagement between a Mexiean force in eommand of Santa Ana, 1,600 in the ranks, and 783 Texans led by Sam Houston, April 21, 1836. The Mexieans were defeated and utterly routed. The seene of this event was on the banks of the San Jaeinto river, 17 miles E. by S. of the present city of Houston.

Sanjak (Turkish, a standard), the name given to a subdivision of an eyalet or minor provinee of Turkey, from the eireumstance that the governor of such distriet is entitled to earry in war a standard of one horse-tail.

San Joaquin, a river of California, 350 miles long; rises in the Sierra Nevada Mountains, in Fresno county, flows S. W. about 70 miles, then N. W., and unites with the Sacramento near its mouth in Suisun Bay. Tulare Lake discharges into it at high water. It is navigable at all seasons by vessels of from 150 to 250 tons to Stockton, about 50 miles; in winter and spring steamers ascend nearly 200 miles further. Its chief tributaries are the Fresno, Mariposa, Merced, Tuolumne, Stanislaus, and Calaveras. The San Joaquin valley is world famed for its fertility.

San José, a city and county-seat of Santa Clara co., Cal.; on the Guadalupe and Coyote rivers, and on the Southern Pacific railroad; 51 miles S. of San Francisco. It contains the State Normal School, the University of the Pacific (M. E.), the College of Notre Dame, St. Joseph's College, the State Asylum for the Chronic Insane, the O'Connor Sanitarium, United States government building, Platt Home for Old Ladies, Home of Benevolence, public library and court house. The city has electric street railroads, electric lights, National and State banks, and daily, weekly, and monthly periodicals. Its manufacturing interest is large, including a woolen mill, silk factories, lumber mills, tanneries, iron foundries, machine shops, and canning establishments. The assessed property valuation is about $16,000,000. The city was established in 1782 by Spaniards, and was the capital of California under its first constitution. Pop. (1890) 18,060; (1900) 21,500; (1910) 28,946.

San Jose, capital of the republic of Costa Rica, Central America It stands on a table-land 4,500 feet above the sea-level. The streets are narrow, and there are few public buildings worthy of note. It is the center of the trade of the state. The climate is healthy, and the town is surrounded with coffee plantations. Pop. (1905) 24,231.

San José Scale, in entomology the *Aspidiotus perniciosus,* a minute tree louse that is particularly destructive to orchards. "Never in the history of economic entomology in the United States," says Prof. L. O. Howard, entomologist of the United States Department of Agriculture, "has a single species of insect excited so much interest as has the San José scale." It is no larger than a fly speck, and is often mistaken for such when appearing on fruit, but when examined with a microscope it is a most formidable six-legged insect. The male is distinguished by wings, the female being wingless. Though named from an American city, the San José scale is a native of Mexico. It has found its way into the United States and many parts of Europe, having been carried from country to country in shipments of fruit. In 1897 Austria legislated against American fruit on the alleged ground of its being infected with this destructive insect. Where it once finds a lodgment it is extremely hard to get rid of, for, besides being very prolific, it is tenacious of life. It drains the juices from the trees, destroying the bark by sapping its life away. Hydrocyanic acid gas as a fumigator is said to kill them, and kerosene oil, used as a wash, is recommended as being equally fatal. But if any escape they will soon infest a large orchard.

San Juan, a province of the Argentine Republic in the W. part; separated from Chile on the W. by the Andes Mountains. It is partly mountainous and partly covered by waterless, frequently sandy, plains. Besides the main chain of the Andes, the sub-Andean chain of the Sierra del Tontal, Sierra de la Huerta 6,600 feet high, and others diversify the surface. In the extreme S. E. sandy plains occupy an area of 965 square miles, and here also lies the large lagoon of Huanacache. The principal rivers are the San Juan, the Jachal, and the Bermejo. The country is rich in minerals. Gold, silver, and copper are mined and there are coal deposits in a few places. The mineral springs, chiefly sulphurous, are used in the baths at Laja, at Pismanta, and at Florida, near San Juan. The dry climate is against the cultivation of the soil, excepting near the rivers, where artificial irrigation is used, and where maize, wheat, lucerne, fruits, and grapes are grown. Agriculture is a chief industry. The wine of this province is excellent. Area 33,715 square miles; pop. (1906) 102,569.

San Juan, the chief pueblo of the Tewa division of the Tanyan Indians of North America; 26 miles N. W. of Santa Fé. These Indians occupy other pueblos in the Rio Grande valley, New Mexico, and have one in Arizona.

San Juan, a river in Bolivia; a tributary of the Pilaya and a sub-tributary of the Pilcomayo. It is nearly 300 miles long. Another river in this country, in the province of Chiquitos, and an affluent of the Aguapehi, has the same name; length, about 200 miles.

San Juan, a river in the Argentine Republic, in the province of San Juan, whose source is in the Andes; flows into the lagoon of Guanacache; length, about 250 miles.

San Juan, the island now known as Porto Rico; named San Juan by Columbus and was so called till the 18th century. It was also known as San Juan de Porto Rico, from the name of its capital.

San Juan Archipelago. See HARO.

San Juan, or **San Juan de la Frontera,** a city of the Argentine Republic; capital of

the province of San Juan; on the San Juan river; 92 miles N. of Mendoza. Pop. (1906) 11,500.

San Juan Boundary, a subject in dispute for 25 years between England and the United States, concerning their respective claims to the island of San Juan in the Gulf of Georgia, on the Pacific coast. The possession of this island, owing to its commanding the straits between British Columbia and the United States, led to constant disputes between the two countries, owing to the uncertain interpretation of the treaty of Washington, June 12, 1846, respecting the boundaries. The matter, by a second treaty of Washington, May 8, 1874, was referred for arbitration to the Emperor of Germany, who decided in favor of the United States in October, 1872. The isle was evacuated by the British on Nov. 22 following.

San Juan del Norte, or **San Juan de Nicaragua.** See GREYTOWN.

San Juan de Porto Rico, the most important city and capital of the island of Porto Rico. It is a valuable seaport and is provided with strong fortifications. The city proper is on a small island, off the province of Bayamon, and adjacent to the N. coast. Its climate is healthful, and it is one of the most prosperous cities in the West Indies. The superior courts of the island meet in San Juan, and among the important buildings are, the bishop's palace, the old government house, a large cathedral, a theater, town house with a fine hall, custom house, the royal military hospital, a seminary, arsenal and jail. Pop. (1910) 48,716. See PORTO RICO.

San Juan de Ulua, or **San Juan de Ulloa,** a fort built on a small island of the same name, in the harbor of Vera Cruz, Mexico. It was constructed in the 17th century and was the strongest fortification owned by the country. It has been conspicuous in Mexican history.

San Juan Hill, Battle of. See SANTIAGO DE CUBA.

San Juan Islands, a group of islands now part of the State of Washington. They were occupied by both American and British garrisons in 1859, each nation claiming the right of exclusive possession. San Juan, Oreas, Lopez, and Shaw are the most valuable of the group. See SAN JUAN BOUNDARY.

San Juan Range, a range of mountains in Southern Colorado; a branch of the Rocky Mountains, and a picturesque setting for San Luis Park. The highest peaks reach an altitude of over 14,000 feet.

Sankey, Ira David, an American evangelist; born in Edinburgh, Pa., August 28, 1840; was associated with the evangelist,

the late DWIGHT L. MOODY (*q. v.*), for some years, attracting and holding the attention of great audiences by singing hymns composed by himself. His religious music became so popular that he published several hymn books under different titles, which are all included in church and Sunday-school service. He died Aug. 13, 1908.

Sankhya, in Brahmanism, one of the six systems of Brahmanical philosophy. It was founded by KAPILA (*q. v.*).

San Luis de Potosi, a city of Mexico; capital of the State of the same name; 198 miles N. W. of Mexico, 6,350 feet above sea-level; regularly built, with fine streets. It has a handsome cathedral; manufactures of clothing, shoes, hats, etc.; railway work shops; and a considerable trade. Pop. (1900) 61,019. The state has an area of 25,316 square miles, is generally fertile, and has rich gold and silver mines. Pop. (1900) 575,432.

San Luiz de Maranham. See MARANHAM.

San Marino, the smallest republic in Europe, and one of its most ancient States; is enclosed by the provinces of Forli and Pesano and Urbino, of the kingdom of Italy; situated 9 miles S. W. of Rimini. The legislature of the republic is a senate of 60 members, elected for life equally from the ranks of nobles, citizens, and peasants. Two presidents are chosen by the senate every six months, called captains regent. Two secretaries of State and two legal functionaries are the other government officials. This little republic occupies a great, rocky, mountainous site, about 2,420 feet high, precipitous on all sides, with intervening dense forests and valleys of fertile land. The town is built round a hermitage, founded in 441, and is accessible by but one road. It is surrounded by great walls and has three forts. The wealthier citizens reside in the suburb of Borgo. The manufacture of silk is the chief industry of the town. Many of the buildings are stately and remarkably massive in structure, including the governor's palace, and six churches, one of which contains the tomb and statue of St. Marino. There are several schools, museums, a theater, a town hall, and two convents. Two immense cisterns provide the public with water. The inhabitants are principally engaged in agriculture. The military number 950 men. From the 10th to the 13th centuries the inhabitants succeeded in maintaining their independence, which was recognized by the Church in 1291, and confirmed by the Pope in 1631. The name of the town is the same as that of the republic. Area of the republic, 23 square miles; pop. about 11,000.

San Martin, José de, a Spanish-American general; born in Yapeyu, Misiones, Argentine Republic, Feb. 25, 1778. He was in the Spanish campaigns against France from 1793 till 1811, attaining the rank of lieutenant-colonel. He resigned from service and sailed for Buenos Ayres in 1812, where he joined the patriot army. In the following year he was placed in command of their forces, serving in Upper Peru or Bolivia. He planned to destroy the Spanish power by securing Chile and then attacking Peru. An army of invasion was drilled for two years at Mendoza, and then San Martin in command of 4,000 men began, Jan. 17, 1817, his famous march over the Andes, leading his force through the Uspallata Pass, 12,800 feet high. On Feb. 12, 1817, he gained the victory of Chacabuco, which was followed by the capture and occupation of Santiago, Feb. 15. He was defeated on March 19, 1818, at Chancha Rayada, but gained a splendid victory on April 5 at the Maipo, which drove the Spaniards from Chile. He was offered the supreme directorship of Chile, but declined it and began preparations for the invasion of Peru. He organized a navy, and his small force of 4,500 men sailed for the Peruvian coast. After much adventurous maneuvering, this army captured and occupied Lima, July 9, 1821, and carried Callao through hard fighting soon after. On Aug. 3, San Martin was proclaimed supreme protector of Peru. At this time Bolivar was leading an army S., and the success of the patriots was threatened by civil war. San Martin gave way to his rival, "for the good of the cause," so averting a contest which might have destroyed the country's independence. On July 26, 1822, he held an interview with Bolivar, after which he resigned his office to the Peruvian congress (Sept. 22), leaving Bolivar to complete the independence of Peru. San Martin retired from South American affairs, went to France and lived there in reduced circumstances till his death in Boulogne, France, Aug. 17, 1850.

Sannazaro, Jacopo, an Italian poet and prose author; born in Naples, July 28, 1458. He was patronized by King Ferdinand of Naples and his sons Alfonso and Frederick III., who made him the companion of their journeys and campaigns. Frederick, who ascended the throne in 1496, gave him the delightful villa of Mergellina, with a pension of 600 ducats. Sannazaro wrote sonnets and *canzoni* and a prose pastoral, "Arcadia," which is his masterpiece, in Italian. He died in Naples April 27, 1530.

San Pablo, a town of Luzon, Philippine Islands, in the province of Laguna, situated about 16 miles S. S. W. of Santa Cruz, on a tributary of Tayabas bay. Pop. (1903) 22,612.

San Pedro (pā'dro), a city and port of entry in Los Angeles county, Cal.; on San Pedro bay, an inlet of the Pacific Ocean, and the San Pedro, Los Angeles & Salt Lake and the Southern Pacific railroads; 22 miles S. of Los Angeles and about 600 miles S. of San Francisco. The city has excellent banking facilities, well-sustained and efficient public schools, and electric lighting and street railway plants, and contains extensive lobster-canning, lumbering, salt, and ship-building establishments. The recent notable development of the city is due to its designation as a port of entry for Southern California, and, to facilitate the movement of shipping, the construction by the National government of a great breakwater (begun in 1900), at a cost of over $3,000,000. This work gives San Pedro, and indirectly Los Angeles, a harbor of refuge of more than a mile square, and deep enough to accommodate the largest ocean-going steamers. The possibilities of the young port of entry are indicated by the official report that during the calendar year 1910 the imports of foreign merchandise aggregated in value $2,259,668, and the exports of domestic commodities, $87,644.

San Rafael, a city of California, county-seat of Marin co.; situated near the N. end of San Francisco bay, on the North Shore and California Northwestern railroads, 15 miles N. of San Francisco. It is an attractive residential city, near Mount Tamalpais, in a region of fine scenery, and is also an educational center and a favorite resort. The surrounding country is agriculturally rich, and the city has a large creamery, soda water works, and other manufactories. Pop. (1900) 3,897; (1910) 5,934.

San Remo, a city of Italy, in the province of Porto Maurizio, on the Riviera, 26 miles E. N. E. of Nice. The old town has narrow streets, winding and steep, but the new town, along the coast, is attractively laid out and built. The city is a popular winter resort. In the vicinity fruits are abundant, and in the city mosaics and perfumes are manufactured. Pop. (1901) 21,440.

San Salvador, the capital of the republic of Salvador, founded in 1525. It has been almost entirely destroyed several times by earthquakes, those of 1854 and 1873 being most disastrous. The city has fine public buildings, including a handsome cathedral, and a large trade in indigo, etc. Pop. (1906) 59,540.

San Salvador, the name given by Columbus to the first island he discovered in the New World. The natives called it Guanahani.

Sansculottes (Fr. "without breeches"), a name given in derision, at the beginning of the French Revolution, by the court party to the democrats of Paris. It afterward became a popular name for radical revolutionists.

San Sebastian, a city and seaport in the N. E. of Spain; capital of the province of Guipuzcoa, partly on the side of Mount Orgullo, which projects into the Bay of Biscay, and partly on the isthmus connecting it with the mainland. The manufactures consist chiefly of cordage, sailcloth, leather, candles, and soap. San Sebastian, having by its early fortifications become the key of Spain on the side of France, figures much in the wars between the two countries. Pop. (1900) 37,812.

San Severino, a town of central Italy; in the province of Macerata, on the right bank of the Potenza, 14 miles S. W. of the city of Macerata. The surrounding country produces cattle, fruit, oil, and wine, in which the town has a good trade. It also has manufactures of flour, glass, machinery, etc. Pop. 3,200.

San Severo, a city of southern Italy, in the province of Foggia, 19 miles N. W. of Foggia, the capital of the province. It has a cathedral, several monasteries and a seminary. The city in 1053 was the scene of a victory by Robert Guiscard over the papal troops of Leo IX. The French destroyed it in 1799. Pop. (1909) 30,040.

Sans Gene, Madame, a nickname of the wife of Marshal Lefebvre, Duke of Danzig. The nickname, signifying "without constraint," is peculiarly applicable to a person ignorant or disregardful of conventional limits and usages. The wife of a soldier whom Napoleon I. raised from the ranks, Madame Lefebvre was first a washerwoman, and then a vivandière, following her husband to the wars. Her innocent rudeness subjected her to court ridicule, but through her high temper and native shrewdness she overcame the difficulties of her position. Sardou's play "Madame Sans-Gêne" (1893), has been produced successfully both in French and English.

Sanskrit, the name of the ancient literary language of India. It forms the extreme branch of the great Indo-Germanic (Indo-European, Aryan) stock of languages, and the one which, thanks to its early literary cultivation (from 1500 B. C.) and grammatical fixation, and its consequent transparency of structure and fullness of form, approaches nearest to the parent language. In some respects, however, the primitive appearance of the Sanskrit, as of the closely allied Iranian or Persic branch, is now generally ascribed to a special Indo-Iranian development, or to a later return to a phonetic phase already outgrown by the parent language at the time of the separation. While it is admitted on all hands that the Aryan dialect out of which the literary language of India has developed can not have been indigenous to the peninsula, but must have been introduced from the N. E., there is still considerable difference of opinion as to the original home of the primitive Aryan community—whether it is to be sought for in Asia, as used to be universally believed till recent years, or whether, as many scholars are now inclined to think, it was from some part of Europe that the Asiatic Aryans originally came. On entering India, the Aryan tribes found the country occupied by people of different races; but, favored by physical and intellectual superiority, they gradually succeeded in extending their sway, as well as their language and their social and religious institutions, over the whole of Northern India.

Though the term Sanskrit, as the "perfected" language, properly speaking only belongs to the grammatically fixed form of the language which was employed from about the 4th or 5th century B. C., and which came more and more to assume the character of a mere literary and learned idiom, it is usual to extend the term so as to include an earlier form of the same language used in the Vedic writings, and hence often called Vedic Sanskrit. The two phases of the language show considerable differences as regards both vocabulary and grammar. The vocabulary of the older language includes numerous words which are no longer used in classical Sanskrit, and the very meaning of which had often become unknown; while, on the other hand, many of the commonest words of the later language are not found in the Vedic writings. As regards the inflectional system, the original wealth of grammatical forms has become considerably reduced in the later phase of the language. Thus, while the classical Sanskrit has but a single infinitive in *tum* —being the accusative case of a verbal abstract noun in *tu*, and corresponding to the Latin first supine (e. g., Sanskrit *dâtum*, *yoktum* = Latin *dătum*, *junctum*) — the Vedic Sanskrit also makes use for the same purpose of different case forms of quite a number of verbal noun-stems, several of which occur again with a similar function in one or other of the allied languages.

Similarly the subjunctive mood, which formed a regular feature of the Indo-Germanic and Vedic verb systems, has almost entirely disappeared from the classical Sanskrit; and alternative declensional and conjugational forms have usually been reduced to a uniform level. Indeed, levelling processes of this kind are seen to have been at work from the earliest times. Thus, a comparison of the language of the older portions of the Rig Veda with that of the later hymns, and the closely allied Atharva Veda, shows how, both in declension and conjugation, vowel stems gradually supersede the original radical and consonantal stems, which less readily adapt themselves to case and personal affixes, and hence are apt to produce anomalies and irregularities. Such modifications become still more marked in

the later Vedic prose writings, the Brâhmanas and Sûtras, which may be considered an intermediate link between the two periods of the language. Though the process of change was at length arrested by rigid grammatical rules, to which every cultivated writer had to conform, it found all the more scope in the popular dialects, which soon lost touch of the literary language and became more and more removed from it.

Literature.— In accordance with the general development of the language, the history of the ancient literature of India may conveniently be divided into two chief periods, the Vedic Literature and the (Classical) Sanskrit Literature. It must be understood, however, that the two periods overlap each other to some extent, inasmuch as certain classes of works, on account of their subject matter as well as the archaic character of their language, have to be grouped along with the Vedic literature, though they cannot have originated, in their present form, till after the language had become settled.

Classical Sanskrit Literature.— The dates of many important Sanskrit works being still very uncertain, it is not yet possible satisfactorily to subdivide this period chronologically; and the usual practice of treating it under the different departments of literature is therefore adhered to.

A. Poetic Literature.—(1) *Epic Poetry.* —The Hindus possess two great national epics, the "Mahâbhârata" and the "Râmâyana." Along with these may be classed the "Purânas," which, though in their present form they are doubtless composed or recast for sectarian purposes several centuries after Christ, seem to contain a considerable amount of genuine old legendary matter akin to large portions of the Mahâbhârata. Though the final redaction of the two epics can scarcely be assigned to an earlier period than about the beginning of our era, it can hardly be doubted that the vast mass of legendary lore and complete epics lays of which the Mahâbhârata is composed, at all events, must have required centuries to grow and assume its present shape. At a subsequent period, from about the 5th or 6th century A. D. onward, there arose a second crop of epic poems of an entirely different character. While the old poems are composed in easy, natural language, such as might well have formed the living though cultured language of the people, these later works are evidently the artificial product of an age when the literary language had long lost touch of the popular mind. Their subject matter, such as there is, is entirely derived from the old legends; but the form in which it is here presented has nothing of the old popular ring about it —elaborate meters, long and complicated compounds, and labored figures of speech through which the epic narrative hardly progresses at all being the characteristic features of most of these productions, built up in accordance with a narrow code of rhetoric. They are nevertheless replete with poetic thoughts and genuine artistic feeling, which only require a less artificial form of presentment to please even the western taste. Of such poems (*kâvya*) there existed a considerable number; but the native taste has singled out six of them as *mahâkâvyas* or great poems — viz., two by Kâlidâsa, by far the greatest poet of this period, the "Raghuvams'a" and the "Kumârasambhava"; further the "Kirâtârjunîya" by Bhâravî (probably a contemporary of Kâlidâsa, 500–550 A. D.); the "S'is'upâlabadha" by Mâgha, hence also called "Mâhakâvya," the "Râvanabadha" or "Bhattikâvya," composed by Bhatti with the view of illustrating the less common grammatical forms of speech; and the "Naishadhiya" of S'rî Harsha (12th century).

(2) *Lyric, Descriptive, and Didactic Poetry.*— In this class of poetic production the palm is usually assigned to two poems by Kâlidâsa — viz., the "Meghadûta," or cloud messenger, where an exiled demigod sends a message of love to his wife by a cloud, to which he describes, in glowing verse pictures, the places and scenes it will have to traverse; and the "Ritusamhâra," a description of the seasons. Of high poetic merit though of a very sensuous character, is also the melodrama "Gîtagovinda" (12th century) of Jayadeva which describes the love making of the god Krishna among the milkmaids, his separation from, and ultimate reconciliation with, his wife Râdhâ; and which, like the Biblical Song of Songs, is considered capable of being explained in a mystic-allegorical sense. Moreover, scattered over dramas and manuals of rhetoric, or collected in poetic anthologies, there are extant thousands of single stanzas, composed with the view of depicting some striking local scene or emotional sensation. They may be likened to our sonnets, being like them artificial productions, though often composed with much skill and neatness, and inspired by genuine poetic sentiment. Didactic poetry, in Indian literature, takes chiefly the form of moral maxims, or sententious truths, expressed in single couplets or stanzas. There are a number of collections of such stanzas, intended to serve as manuals of ethical and social science, the best known of which are the "Râjanîtisamuchchaya," or "collection on the conduct of kings," ascribed to Chânakaya; the "Kâmandakîya-Nîtisâra," by Kâmandaki; and the "Nîtis'ataka," or century (of stanzas) on ethic science, by Bhartrihari, who also wrote two centuries of erotic and devotional verses. To render moral instructions more attractive to the youthful mind, sententious verses of this kind were also combined with humorous stories and fables;

the most famous reading books of this class being the well-known "Panchatantra" or "five books," and the popular recast of it called "Hitopades'a," or "good counsel"; further, the "Vetâlapanchavims'ati," or 25 (tales) of the goblin; the "Simhâsanadâvtrims'ikâ," or 32 (stories) of the throne; and the "S'ukapatati," or 70 (tales) of the parrot. Two highly popular collections of versified fairy tales are Kshemendra's "Vrihatkathâ," or great story (A. D. 1030), and Somadeva's "Kathâsaritsâgara" (trans. by C. H. Tawney), or "oceans of rivers of story" (1120). The Sanskrit novelistic prose literature, on the other hand, is very scanty, and characterized by a stilted, highly involved style, the few best-known works of this class being Dandin's "Das'akumâracharita" (6th century), or adventures of the 10 princes (trans. by P. W. Jacob); Subandhu's "Vâsavadattâ"; and Bâna's "Kâdambarî" (A. D. 620).

(3) *Drama.*—Though dramatic performances of some kind seem to go back to pretty early times, none of the existing plays are probably older than the 5th century of our era. The language is usually of a mixed nature, higher male characters speaking in Sanskrit, while women and lower male characters use Prâkrits, or popular dialects. Plays invariably begin with a benediction and a prelude in the form of a dialogue between the stage manager and one of the actors, containing some allusion to the author, and leading over to the opening scene. Two standing and interesting characters of the Indian stage are the Vita, or dissolute associate of the hero, somewhat resembling the parasite of the Greek comedy, and the Vidûshaka, his humorous companion, or Gracioso. The extant plays number about 50. Their plots are usually based on the epic legends. The greatest of Indian playwrights is Kâlidâsa, the author of the "S'akuntalâ," the "Vikramorvas'î," and "Mâlavikâgnimitra." Possibly somewhat older than these, and certainly highly interesting as a vivid picture of the social life of the time, is the "Mrichchhakatikâ," or toy cart, ascribed to a king Sûdraka. Next to Kâlidâsa, in the estimation of native scholars, ranks Bhavabhûti, likewise the author of three plays — viz., the heroic dramas "Mahâvîracharita" and "Uttararâmacharita," and the domestic drama "Mâlatîmâdhava." He is, however, far less of an artist than his great rival, and his language is much more artificial. Besides these may be mentioned S'rî Harshadeva, King of Kanauj (625), the reputed author (or patron) of the "Ratnâvalî," "Nâgânanda," and the "Priyadars'ikâ"; Bhatta Nârâyana, author of the "Venîsamhâra"; and Krissnamis'ra (12th century), who wrote the "Prabodhachandrodaya," or "moonrise of Intelligence," a rather tedious allegorical play, the characters of which consist entirely of abstract ideas — virtues and vices — ranged in two contending armies.

B. Scientific Literature.—The first beginnings of nearly all the branches of scientific inquiry cultivated in Mediæval India may be traced back to the later Vedictimes, being the natural outgrowth of the Vedic religion and of the study of the sacred writings. This fact indeed receives a direct recognition in the traditionary classification itself, inasmuch as it includes among the Vedic literature, under the title of "Vedânga," or members of the Veda, the original or fundamental treatises of six sciences — viz., phonetics, prosody, grammar, etymology, astronomy, and ceremonial law. Though some of these treatises, in their present form at all events, cannot justly lay claim to so high an antiquity, it is not improbable that they are based on older treatises on their respective subjects.

(1) *Law.*—The earliest attempts at an orderly statement of social and civil usages are to be found in the "Dharmasûtras," or rules of law, which form part of some of the Kalpasûtras, or ceremonial rules, in close connection with the Grihyasûtras, or rules of domestic rites, out of which they may indeed have originally grown. The few still extant sets of Dharmasûtras — viz., those of Baudhâyana," "Âpastaniba," "Gautama," and "Vâsishtha"— though mainly composed in aphorisms, are interspersed with couplets or stanzas giving the substance of several rules; and it is in these detached verses that many scholars would trace the first tendency toward the composition of the versified codes of law, the "Dharmas'âstras" or "Smritis," which, somewhere about the beginning of our era, came to supplant the Sûtra codes, and remained for centuries the standard authorities on matters of law. While some few of these new codes, like their prose prototypes, appear to have been directly connected with certain Vedic schools, such does not seem to have been the case as regards the vast majority of them, which were called by their authors, more or less fancifully, either after some old semi-mythic teacher or sage, such as Atri, Hârîta, S'âtâtapa, or even after some god, such as Vishnu, Brihaspati, Yama. Hindu law usually recognizes three distinct divisions — viz., established usage; civil procedure; and penance. The three most important Smritis are those of "Manu," "Yâjnavalkya," and Parâs'ara." This last code lacks, however, the section on civil law, which was only supplied some 500 years ago by the famous exegete Mâdhava, who composed a digest of law, based on Parâs'ara, with a special chapter on Vyavahâra. The new school of practical jurisprudence to which this work belongs was ushered in by Vijnânes'vara's "Mitâksharâ" (11th century), which, though pri-

Sanskrit

marily a commentary on Yâjnavalkya, constantly quotes other authorities, and thus serves the purposes of a digest of law, and remains to this day one of the standard works on Hindu law. Among other famous digests may be mentioned Devannabhatta's "Smritichandrikâ" (13th century), highly esteemed in Southern India; Jîmûtavâhana's "Dâyabhâga," the chief authority on inheritance in the Bengal school; the "Vîramitrodaya," by Mitramis'ra (1625); and the "Vyavahâramayûkha," being the civil law section of a general digest by Bhatta Nîlakantha (1640).

(2) *Philosophy.*—While the main body of the Vedic hymns are the immediate outgrowth of a worship of the elemental forces of nature, not a few of the hymns, especially the later ones, evidence a strong tendency toward metaphysical speculation. It is only in the "Upanishads," however, that we meet with the first attempts at some kind of systematic treatment of the great problems of mundane existence, and of the nature of the absolute spirit and its relation to the human mind. The drift of speculative inquiry in those days, as ever afterward, is determined by two cardinal notions which are never questioned, and have assumed the force of axioms in Hindu philosophy — viz., the pantheistic notion of the spiritual unity of all sentient beings, and the transmigration of souls. To the Hindu mind the latter notion seems the necessary consequence of the former. All individual souls are identical in nature, having emanated from, and being destined to return to, the infinite, all-pervading spiritual essence, the Brahman or Atman. The apparent difference of the spiritual element in different kinds of animated beings (elemental gods, men, animals, plants) is due to a greater or less degree of contamination with matter, and consequent obscuration; and it is only by a gradual process of improvement and purification, in repeated terms of bodily existence — *i. e.*, through metempsychosis — that lower beings can raise themselves to the state of purity requisite for their union with the Supreme Spirit. Ignorance of its own real nature, and of its identity with the world soul, is what alone keeps the individual soul chained to matter, and to material existence with its hateful accompaniment of passion and suffering. To dispel this ignorance by setting forth the true relations between the individual being and the Brahman, as a preliminary to final emancipation, is the task and aim of philosophy.

Six philosophical systems are recognized by orthodox Hindus, which fall, however, into three pairs so closely connected that each pair forms a common school of philosophy — viz., "Mîmâmsâ" and "Vedânta," "Sânkhya" and "Yoga," "Nyâya" and "Vais'eshika." Nothing certain is as yet known as to their date or order. The tenets of each system are propounded in a manual of concise aphorisms, ascribed to the respective founder, and commented on by numerous writers.

The "Mîmâmsâ"—or properly "Pûrva-Mîmâmsâ," "Prior Inquiry"—is mainly a systematic exposition of the principles of scriptural interpretation. Its chief object is to maintain the authority of the Veda, and to urge the necessity of performing the duties enjoined therein, especially those of a ceremonial kind, with a view to securing the benefits, temporal and eternal, accruing from these meritorious works as the logical effect of an operative cause. A philosophical basis is secured for these dogmatic theories by the inclusion of verbal communication among the five or six sources of knowledge, or modes of proof, agreed on by both schools of the Mîmâmsâ. The sage Jaimini is the reputed founder of this school, and author of its fundamental sûtras, which were afterward commented upon and supplemented by S'abara Svâmin and Kumârila Bhatta.

The "Vedânta," *i. e.*, "end of the Veda"—as the "Uttara-Mîmâmsâ" ("Later Inquiry") is more commonly called — is the system most closely in accord with the development of religious thought in Brahmanical India. In its main features it simply formulates and carries on the speculations of the older Upanishads. According to this system, God is the omniscient and omnipotent cause, efficient as well as material, of the world: He is both creator and nature; and at the consummation of things all are resolved into Him. The individual soul is of the same essence as the supreme one; it emanates from Him like one of the sparks that issue from a blazing fire, and ultimately returns to Him. It is not a free agent, but ruled by God; its activity — the source of its suffering — being solely due to its bodily organs. While the evolution of the elements and organized bodies is minutely expounded in the original aphorisms — the Brahma-sûtras of Bâdarâyana — the questions as to the *raison d'être* of material existence and the origin of evil find no satisfactory explanation. It is only by a later school of Vedântists, represented by the famous theologian S'ankara-âchârya, in his commentary on those sûtras, that a solution is found in the theory that the material world has no real existence, but is a mere illusion. This school is called the "Advaita," or non-duality, school of Vedânta philosophy. In opposition to it arose two other schools, both of which identify the supreme spirit with Vishnu — viz., that of "Râmânuja" (11th century), the founder of the S'rî-Vaishnava sect, usually called the "Vis'ishtâdvaita," or qualified non-quality school, because they allow the Brahman to be "qualified" by all good qualities, and to be "distinct" from matter; and the school of Madhva-âchârya (12th century),

called the "Dvaita, or duality, school from their maintaining the supreme spirit to be distinct both from man and from matter. These schools in fact show a certain leaning toward Sânkhya doctrines. The Râmânujas and other Vaishnava sects — especially the one founded by Chaitanya — have, moreover, grafted on the Vedânta the doctrine and practices of implicit faith and fervent devotion which had early found expression in works such as the famous philosophic episode of the Mahâbhârata, the Bhagavadgîtâ, and the Bhâgavatapurâna, and had been formulated in the "S'ândilya-Bhakti-sûtra."

The "Sânkhuya" system, as propounded in the Sânkhya-sûtras ascribed to Kapila, represents the materialistic school of orthodox Indian philosophy. It maintains the external coexistence of a material first cause — the prime originant (plastic nature); also called *pradhâna,* or "principal (cause)" — and a plurality of spiritual entities or selves connected with matter from all eternity. From the material first cause, devoid of intelligence, the phenomenal universe has been developed by a gradual process of unconscious evolution. The school thus denying the existence of an intelligent ruler is often called "godless." The most popular summary of the doctrines of this system is the "Sânkhya-sâra," by Vijnâna Bhikshu (16th century).

The "Yoga" school founded by Patanjali, accepts the speculative system of the Sânkhya with its 24 principles; but adds thereto a 25th — viz., the "self devoid of attributes," the supreme god of the school, whence the "Yoga" is also called the Theistic Sânkhya. Moreover, the school has developed, as its most characteristic feature, a complicated system of ascetic practices for the mortification of the senses, with a view to bringing about, even during life, a spiritual union with the supreme spirit.

The "Nyâya" and "Vais'eshika," though differing from each other on some important points, such as the number of the modes of proof, may be considered as two branches of a single analytical system of philosophy which supplement each other and are commonly studied together. The "Nyâya" (literally, "method," "rule"), ascribed to Gotama (or Gautama, also called "Akshapâda"), though, like the other systems, it professes to deal with the whole round of metaphysical subjects necessary for complete knowledge and final emancipation, is especially remarkable for the very complete system of dialectics which it has developed, and which has gained for it the title of the Hindu science of logic. A regular argument, or complete syllogism, according to this system, consists of five members — viz., (*a*) the proposition, (*b*) the reason; (*c*) the instance; (*d*) the application; (*e*) the conclusion. The "Vais'e-shika" system, put forward by Kanâda, also called "Kâs'yapa," while on the whole accepting the analytical principles of the "Nyâya," occupies itself more especially with the physical or cosmic aspect of metaphysics; its name being derived from the assumption of atoms, or ultimate substances possessed of separate individuality, which are innumerable and eternal, and of which the phenomenal world is composed. Their aggregation, according to the original view of the school, is caused by an invisible force, while at a later stage it is ascribed to a supreme soul, distinct from the individual souls, forming the immaterial atoms.

Of heterodox systems of philosophy — besides those of the Jainas and Buddhists — only one deserves special mention — viz., the "Châryâkas," or "Lokâyatikas" ("materialists"). The doctrines of this school, traditionally ascribed to Brihaspati, admit but one source of knowledge and proof — viz., perception. According to them there is neither a supreme spirit, nor a future life, nor a soul distinct from the body; and the sole end of man is enjoyment derived from sensual pleasures.

A kind of mystic philosophy — in the sense in which the peculiar practices of the "Yoga" are regarded as such — underlies the doctrines promulgated by the "Tantras," the religious text-books of the numerous sects of S'âktas — *i. e.,* worshipers of the *s'akti,* or active divine energy, personified in some female deity, especially in one of the many forms of Pârvatî, the wife of S'iva. In its origin, the worship of the female principle as a means of obtaining transcendental powers is probably based on the Sânkhya notion of the *prakriti* or plastic material principle as the prime cause of the universe; and considering that this form of belief is referred to among the heterodox doctrines contended against by S'ankarâchârya, it would seem to be of tolerable antiquity, though probably not in the grossly licentious form in which it is inculcated in many of the Tantric writings. The number of original Tantras is usually fixed at 64. The best-known works of this class are the "Rudrayâmala," "Kulârnava," "S'yâmarahasya," and "Kâlikâtantra."

(3) *Grammar.*— Grammatical research in India probably goes back to nearly as early times as the redaction of the Vedic hymns. The work traditionally accepted as the Vedânga-treatise in this science — viz., the "Ashtâdhyâyi," or "eight chapters" of aphoristic rules, by Pânini — marks the very highest point of its development, and would seem to presuppose a long period of growth. To the same author is ascribed the original treatise of another Vedânga — viz., phonetics, treating of the nature of the letters and accents and the proper mode of sounding them. To this latter branch of science have to be referred the "Prâtis'-âkhyas," elaborate treatises on the phonetic

changes undergone by words in the connected form of the Vedic texts. Such treatises are in existence for all the Samhitâs, except the Sâmaveda; those of the Rik and Atharvan being ascribed to S'aunaka, that of the Vâjasanayi-samhitâ to Kâtyâyana, while the author of the Taittirîya-prâtis'âkhya is unknown. Whether these works are anterior or posterior to Pânini is still doubtful. Here must also be mentioned the oldest work on etymology and Vedic interpretation, Yâska's "Nirukta," which is probably older than Pânini's grammar. Pânini's rules were partially amended and supplemented in Kâtyâyana's "Vârttikas," which on their part were critically examined by Patanjali, in his "Mahâbhâshya," or "great commentary." So minute and complete was the grammatical analysis of the language presented in these works that the efforts of subsequent authors of grammars were mainly directed toward the best rearrangement of the linguistic matter for practical educational purposes. The most important of these grammars, forming the text-books of grammatical schools, are the "Chândra-vyâkarana," by Chandra-gomin of Kashmir (2d century, A. D.); the "Kâtantra," by Sarvavârman 6th century); the text-book of the Kâlâpa or Kaumâra school; the "Sârasvatî prakriyâ," by Anubhûti-svarûpâchârya; the "Haima-vyâkarana," by Hemachandra (12th century); the "Mugdhabodha," by Vopadeva (13th century); and the Siddhânta-kaumudî," by Bhattoji-dîkshita (17th century).

(4) *Lexicography.*— Native dictionaries, generally composed in verse, are either homonymous or synonymous. In the former the words explained are usually arranged according to the final consonant and then according to the number of syllables they contain. The most famous dictionary (chiefly synonymous), and one of the oldest, is the "Amarakosha," or "Immortal treasury," by Amarasimha (550). Of others the most important are Hemachandra's "Abhidhâna-chintâmani," Halâyudha's "Abhidhâna-ratnamâlâ" (11th century), and the "Medinî" (13th century).

(5) *Prosody.*— The privilege of representing this science among the Vedângas is assigned to the "Chhandah-sûtra," ascribed to Pingala, who is traditionally identified with Patanjali, the grammarian. But, strange to say, the section of this work treating of Vedic meters is very meager, while the chapter on post-Vedic meters is tolerably complete, and, with a commentary on it by Halâyudha (probably the lexicographer), still forms one of the chief authorities on prosody. Of other important manuals may be mentioned the "Vrittaratnâkara," or "jewel mine of rhythms," by Kedârabhatta (before the 13th century); and the "Chhandomanjarî," or "cluster of meters," by Gangâdâsa.

(6) *Music.*— The existing treatises on music are of comparatively modern origin. The two most important are the "Samgîta-ratnâkara," or "jewel mine of harmony," by S'ârngadeva, and the "Samgîta-darpana," or "mirror of harmony," by Dâmodara. These works treat not only of music proper — including the notes, melodies, and measures, singing, concerted music, and instruments — but also of dancing, acting, and mimic representation.

(7) *Rhetoric.*— The theory of poetic composition and the approved forms of literary style has been a favorite subject with Hindu writers; and the result of their labors is a minute classification of the various forms of composition, and an elaborate system of rules regarding the different sentiments and forms of speech applicable to certain characters and conditions of life. Dramatic poetry, as the most varied form of literary composition, usually occupied a large share of the attention of rhetorical writers. The "Bharata-s'âstra," which is only imperfectly known, is considered the most ancient of the existing manuals of this art. Whether the author preceded the brilliant period of artificial poetry from the 5th century of our era onward is still uncertain. The earliest work the date of which has been fairly ascertained is the "Kâvyâdars'a," "mirror of poetry," by Dandin (6th century). Of other works on poetics generally may be mentioned the "Kâvya-prakâs'a," or "luster of poetry," by Mammata (12th century), and especially the "Sâhitya-darpana," or "mirror of composition," by Vis'vanâtha Kavirâja (15th century), the standard authority on literary criticism. The favorite manual of dramaturgy is the "Das'arûpa," or "10 forms" (of plays), by Dhananjaya (10th century).

(8) *Medicine.*—The oldest systematic treatises on medical subjects are the "Samhitâs" of Charaka and Sus'ruta. Both works are composed in verse mixed with prose sections, and are characterized by great diffuseness. Of later handbooks of medical science may be mentioned Vâgbhata's "Ashtângahridaya" and Bhâvamis'ra's "Bhâvaprakâs'a"; while the "Râjanighantu," by the Kashmirian Narahari, is the most approved manual of materia medica.

(9) *Astronomy and Mathematics.*— This science appears as one of the Vedângas, or members of the Veda; and the treatise which has been handed down as such in the Rik and Yajus recensions — viz., the "Jyotisham"— presents indeed a comparatively primitive appearance, as it knows only a lunar year and 360 days, and mentions neither the zodiac nor the planets. Much the same phase of knowledge is represented by some other works, such as the "Gârgî Samhitâ." A new scientific era, brought about

by a knowledge of Greek astronomy, began about A. D. 250, and gave rise in the first place, to five works called "Siddhânta," and later on the standard works on astronomy viz., Âryabhata's "Âryabhatîyam" (500), Varâhamihira's "Brihatsamhitâ" (540), Brahmagupta's "Brahmasiddhânta" (625), and Bhâskara Âchârya's "Sûryas'iromani" (completed in 1150). The mathematical sections of several of these works, especially those of Âryabhata and Bhâskara, have remained standard text-books of mathematics down to recent times.

Sansovino, Andrea, a Tuscan sculptor and architect; born in Monte Sansovino, Tuscany, in 1460. He was appointed by Pope Julius II. to build the tombs of Cardinals Rovere and Sforza. His other works include the group "Baptism of Christ"; "Madonna and Child"; the bas-reliefs on the exterior of the marble temple inclosing the Santa Casa, etc. He died in Rome in 1529.

SANSOVINO'S BAPTISM OF CHRIST.

San Stefano, Treaty of, a treaty which put an end to the Russo-Turkish War; concluded March 3, 1878, at San Stefano, a town W. of Constantinople and a port on the Sea of Marmora. By its terms Bulgaria was to become a principality, extending from the Danube to the Ægean, and Rumania, Servia, and Montenegro were recognized as independent. Russia was to receive a war indemnity of 300,000,000 roubles, and the Dobrudja, Kars, Batum, and other possessions. The congress held at Berlin, in June and July, 1878, greatly altered the provisions of this treaty, effecting peace on somewhat more moderate terms.

Santa Ana, a tribe of North American Indians that live in a pueblo in North Central New Mexico, on the Rio Jemez, a tributary of the Rio Grande. The Spanish applied this name to the mission established at this pueblo, whose native name was Tamaya. This village is one of several in New Mexico occupied by the Keresan stock of Indians, under different names.

Santa Ana, or **Santa Anna, Antonio Lopez de,** a Mexican president; born in Talaha, Mexico, Feb. 21, 1795. He took a prominent part in the expulsion of the Spaniards from Mexico, and proclaimed the Mexican Republic in 1822. He was in the front during all the Mexican troubles till 1833 when he became president. In 1836 he was defeated and taken prisoner by the Texans, but returned the following year. He was again president in 1846 and commanded in the war with the United States (1846–1848). After General Scott's occupation of the city of Mexico, in September, 1847, he resigned and left the country, but was president in 1853–1855. He died in the City of Mexico, June 21, 1876.

Santayana, George, a Spanish-American poet and educator; born in Spain in 1863. He became Professor of Philosophy at Harvard in 1907, and published: "Sonnets and Other Poems," and "The Sense of Beauty: An Outline of Æsthetic Theory" (1896); "Lucifer: A Theological Tragedy" (1899); "Interpretations of Poetry and Religion" (1900); "The Hermit's Christmas" (1901); and other poems.

Santa Barbara, a city and county-seat of Santa Barbara co., Cal.; on Santa Barbara channel, and on the Southern Pacific railroad; 362 miles S. E. of San Francisco. It is located in a region of equitable climate, which makes it famous as a midwinter health resort. It is also in a section rich in agriculture and stock raising, and in the production of fruit and wool. Here are a collegiate institute, a high school, libraries, street railroad and electric light plants, many mineral springs, National and State banks, and daily and weekly newspapers. There is a fine harbor, and daily steamboat service N. and S. Santa Barbara exports English walnuts, olive oil, lima beans, and citrus fruits. The assessed property valuation exceeds $4,000,000. Pop. (1890) 5,864; (1900) 6,587; (1910) 11,659.

Santa Barbara Channel, a passage of the sea between the San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands of the Santa Barbara group, and the coast of California; its width varies from 20 to 30 miles.

Santa Barbara Islands, a group of islands off the coast of California, extending about 175 miles. They lie opposite Santa Barbara, Los Angeles, and San Diego counties, at a distance varying from 20 to 65 miles. They are nine in number, and consist of San Miguel, Santa Rosa, Santa Cruz, Anacape, Santa Barbara, Santa Catalina, San Clemente, San Nicolas, and San Juan.

Santa Catharina (-kä-tä-ree'nä), a maritime state of South Brazil, bordering on the Atlantic; area, 28,632 square miles; surface, mountainous, except along the coast, which is low; soil, generally fertile; climate, mild and healthy; productions, rice, manioc, millet, sugar, coffee, and cochineal. Chief towns: Desterro (capital, on Santa Catarina Island), Sao Francisco, and Laguna. Pop. (1900) 320,289.

A fortified island of Brazil, off the coast of the above state, 30 miles long, and 8 broad. Surface, mountainous and well watered.

Santa Claus. See KRISS KRINGLE: ST. NICHOLAS.

Santa Clara, Order of. See CLAIRE, ST.

Santa Cruz, a city and county-seat of Santa Cruz co., Cal.; on the San Lorenzo river, Monterey Bay, and the Southern Pacific railroad; 80 miles S. of San Francisco. It is one of the best known watering places in California, being situated on a sheltered and beautiful site on the N. shore of the bay. It contains the Holy Cross School (R. C.), high school, public library, street railroad and electric light plants, waterworks, State banks, and daily, weekly, and monthly periodicals. It has manufactories of soap, glue, lime, leather, powder, lumber, paper, bitumen, etc., and an assessed property valuation of nearly $3,500,000. Pop. (1900) 5,659; (1910) 11,146.

Santa Cruz, the capital and chief port of the Canary Islands on the N. E. coast of Teneriffe. The streets are well paved, but the houses are small and the public buildings few. There is an excellent harbor protected by a mole, and the coast is defended by a number of forts. Wine, brandy, tobacco, and cochineal are the chief exports. Pop. (1900) commune, 38,419.

Santa Cruz Islands, an archipelago in the Pacific Ocean, between the New Hebrides and the Solomon Islands; area, 360 square miles. It is under British protectorate.

Santa Fé, a city, capital of the new State of New Mexico, and county-seat of Santa Fé co.; on Santa Fé creek, and on the Denver and Rio Grande and the Atchison, Topeka, and Santa Fé railroads; 20 miles E. of the Rio Grande, and 275 miles S. by W. of Denver, Col. The city contains a United States government building, the Capitol built of cream sandstone, court house, the University of New Mexico, St. Michael's College (R. C.), Presbyterian Academy, Loretto Academy, New Mexico School for the Deaf and Dumb, St. Catharine's School for Indian Boys, the Romona Industrial School for Indian Girls, penitentiary, Roman Catholic Orphan Asylum, St. Vincent's Hospital, etc. There are also waterworks, electric lights, a National bank and daily and several weekly newspapers. The industries consist principally of farming, mining, and stock raising. The climate is very agreeable. The unpaved streets are narrow, crooked, and ancient looking, and the buildings are nearly all of adobe and one story high. When first visited by the Spaniards, about 1542, the town was a populous Indian pueblo. Pop. (1900) 5,603; (1910) 5,072.

Santalaceæ, sandalworts; an order of epigynous exogens, alliance Asarales; trees, shrubs, undershrubs, or herbs, having alternate or nearly opposite leaves, often minute; small flowers in spikes, in umbels, or solitary; calyx superior, four- or five-cleft, half colored, with valvate æstivation; corolla none; stamens four or five, opposite the segments of the calyx; ovary one-celled, with one to four pendulous ovules near the top of a central placenta; fruit a one-seeded hard and dry drupe; found in Europe and North America as small weeds; in the East Indies, Australia, and the South Sea Islands as large shrubs or small trees; known genera 18 species 110 (Lindley); genera 20, species 200 (Sir J. Hooker).

Santa Maura. See LEUKAS.

Santal Parganas, The, a district in the Bhagalpur division of Bengal, British India; area, 5,456 square miles. The Ganges which bounds the district on the N. and partly on the E., forms also its chief drainage. Various minerals, as coal, iron, and silver, have been found in this district. The district is named from the Santáls, who form the most characteristic portion of its inhabitants, and are also found elsewhere in India. They are one of the aboriginal races belonging to the Dravidian stock, are dark-colored, and mostly profess a religion of their own, in which the worship of a chief deity and subordinate deities and a sort of ancestor worship play a chief part. They live chiefly by hunting, and are exceedingly fond of flute-playing, dancing, and singing.

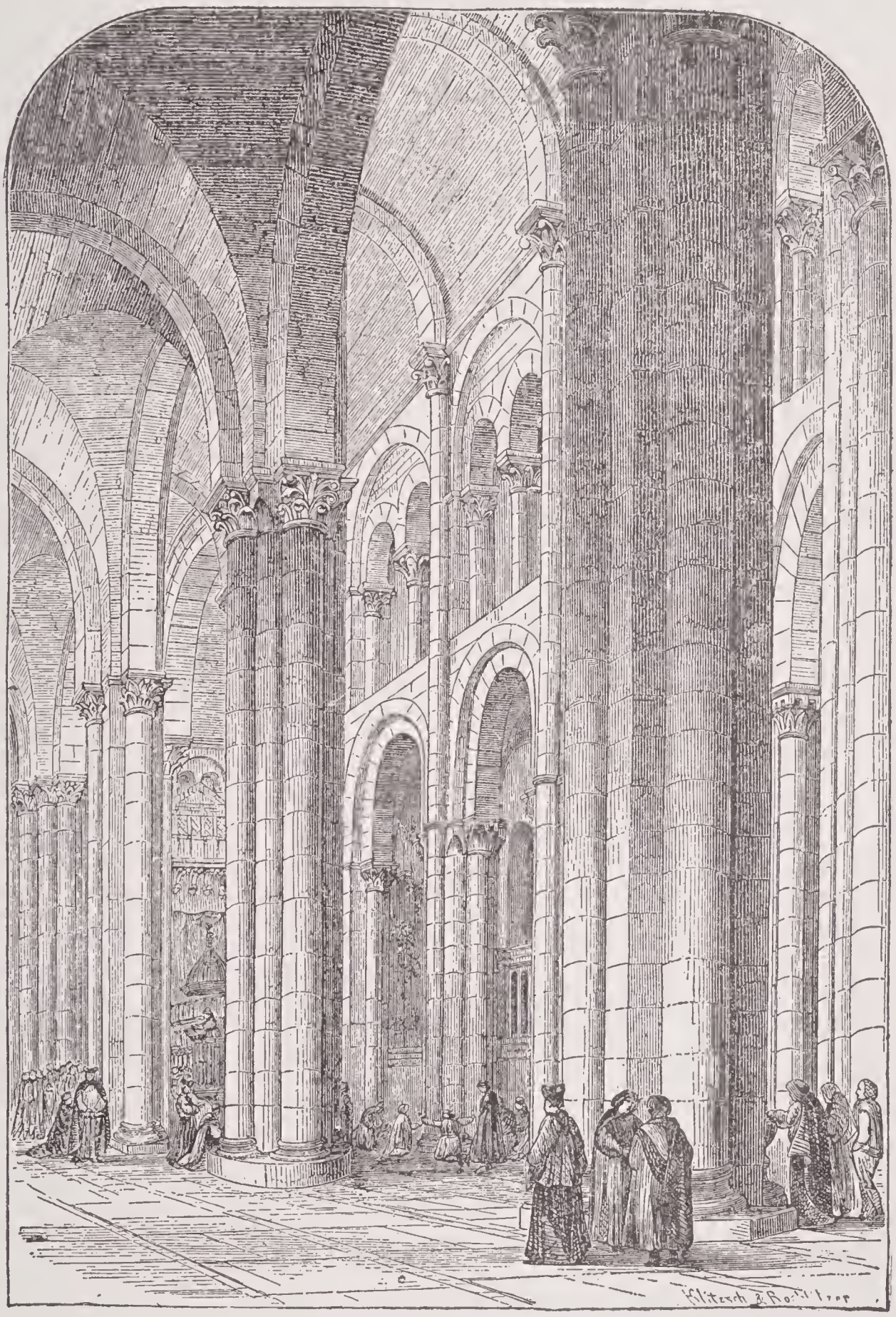
Santal Wood, a dye wood obtained from *Pterocarpus santalinus,* a leguminous tree of the East Indies, Madagascar, etc.; also called sanders or saunders wood and red sandal wood. Santaline, a substance obtained from it, is used in dyeing blue and brown.

Santander, a seaport on the N. coast of Spain; on an inlet of the Bay of Biscay, about equally distant from Oviedo on the W. and San Sebastian on the E.; 316 miles N. of Madrid. The bay on which it stands is accessible to the largest vessels at all times. The town occupies a picturesque site, but is quite modern in appearance, and has few buildings of note. Of its former convents one now serves as a theater, another as a cigar factory, giving employment to about 1,000 people. The remaining industries are chiefly breweries, cotton, paper, and flour mills, iron foundries, and ship-building yards. The commerce of the port increases steadily: the exports — flour, wine, foodstuffs, and metals — have in some years reached a value of about $4,500,000, and the imports — tobacco, foodstuffs, codfish, iron and steel goods, textiles, coal, petroleum, chemicals, timber, etc.— a value of $10,000,000. On Nov. 4, 1893, a ship discharging in the harbor took fire, and the consequent explosion of 21 cases of dynamite destroyed quays, whole streets of houses, and hundreds of lives. Santander is a favorite seaside resort in summer. It was here Charles I. embarked for England after his trip to the Spanish

court. The town was sacked by Soult in 1808. Pop. (1900) 54,694.

Santa Rosa, a city and county-seat of Sonoma co., Cal.; on Santa Rosa creek, and on the San Francisco and North Pacific railroad; 57 miles N. by W. of San Francisco. It is in a fertile valley and has a delightful climate, highly adapted to the culture of grapes. It contains the Pacific Methodist College, the Christian College, a National bank, and daily and weekly newspapers. There are a brewery, manufactories of iron, soap, carriages, wool machinery, etc., and an assessed property valuation of about $3,500,000. Pop. (1900) 6,673; (1910) 7,817.

Santerre, Antoine Joseph (so*ng*-tār'), military officer; born in Paris, France, March 16, 1752. As a wealthy brewer he was notable during the French Revolution for his influence over the Parisian mob in the attacks on the Bastille and the Tuileries. Though formerly considered as one of the monsters of the



SANTIAGO DE COMPOSTELLA: INTERIOR OF CATHEDRAL.

Revolution, there is no evidence for such a belief. He rose to be commander of the National guard and a Field Marshal. He died in Paris, Feb. 6, 1809.

Santiago, the capital of the Republic of Chile and of the province of the same name, beautifully situated at the foot of the Andes, 112 miles E. of Valparaiso. It is intersected by the Mapocho, a rapid stream issuing from the Andes, has water channels in many of the streets, is lighted by electricity, and furnished with tramways. Owing to the prevalence of earthquakes the houses are mostly of one story, and generally occupy a large space of ground, having gardens and patios or courts in the interior. The Plaza or Great Square is a large open area adorned with a fine fountain; around it are the municipal buildings and criminal courts, the post office, the old palace, formerly the residence of the presidents, now used as barracks, the cathedral, etc. There are also a mint, a well-appointed university with about 1,000 students, high class secondary schools, schools of art, military school, normal schools, theater, museum, etc. The city was founded in 1541. The most memorable event in its history was the burning of a church, in which about 2,000 persons perished, in 1863. Gold, silver, and lead are exported. It is the largest city on the W. coast of South America. Pop. (1907) 332,724.

Santiago, or **Santiago de los Caballeros,** a town of Santo Domingo; on the Yaqui river; is one of the most important towns of the republic, having large commercial interests and an extensive tobacco trade. Pop. (1897) 12,000.

Santiago de Compostella, a city of Spain; in the province of Corunna, and on the slope of Monte Pedroso. It is the see of an archbishop. The cathedral, begun 1082, is in the form of a Latin cross; near it is a large hostel, founded for pilgrims. The town was built around a chapel, afterward made the cathedral, on the site popularly believed to be the grave of the apostle St. James, whose bones are said to be in the foundation. For several centuries it was the most frequented place of pilgrimage of Western Europe, and it has been called the "Mecca of Spain." The cathedral has a modern front, but part of the interior was built in the 9th century and is noted for its splendid proportions, lofty outline, and beautiful Gothic columns. There is a large hospital founded by Ferdinand and Isabella in 1504, and a university founded in 1532. There are many ruined convents in the city. It has numerous manufactures of hosiery, linen, cotton, silk, leather, paper, and wine, but its trade has much declined during the last four centuries. Pop. (1900) 24,120.

Santiago

Santiago de Cuba, a city, seaport, and capital of the province of the same name, Cuba; on a beautiful harbor opening through a narrow pass into the Caribbean Sea. It was made famous in the American-Spanish War by the splendid victory achieved by the American fleet outside of its harbor, and the later occupation of the city by American troops on the surrender of the Spanish army. The Spaniards claim that it is the oldest city in North America. It was founded in 1514 by Don Velasquez, the conqueror; is built on the side of a hill 160 feet above the bay and its harbor is one of the best along the American continent, but extremely difficult of access owing to the narrowness of its entrance.

The peculiar narrow streets and the façades of the houses are like those in some of the old towns in Italy; but there the resemblance ceases, for the houses of Santiago are nearly all built around a court, or patio, as they are in most Spanish towns. With their high barred windows and glaring plastered walls, on the outside they look more like prisons than like the American idea of dwelling houses. But inside the patio everything is different. There are palms and shrubs and flowers, and in some of the richer houses even fountains. Meals are often served in the patio in pleasant weather.

In Santiago, as well as in other Cuban cities, the proprietors of most of the shops and warehouses live in the same building in which their business is conducted. The shops open about 9 o'clock in the morning and remain open till about noon, when they close up, and everybody goes to the midday meal. After that everybody takes a nap in the heat of the day. The shops open again about 2 o'clock in the afternoon and remain open till half past five or six.

Like Havana and San Juan, Santiago has its Castle Morro, built by the old Spanish warrior, Pedro de la Rocca, then governor of the province, about the year 1640, on the mountain to the right of the entrance. The word Morro means "overhanging lip", and all three castles mentioned are erected on extreme points of land commanding harbor approaches. That at Santiago is certainly the most picturesque; but looking at it one would scarcely credit it as possessing much effectiveness when pitted against modern men-of-war. From the point of view of the artist, however, it is perfect. A flight of well-worn steps winds from the water's edge up the side of the grim old brown and yellow walls, all covered with moss and ivy, to the battlements on top, while the moat, drawbridge and other surroundings make up a charming picture, suggestive of the days of gallant knights and imprisoned maidens. On the

Santiago

mountain to the left is Castle la Socapa, also presenting a very picturesque appearance, while further inland, on the same side as Morro, is a small fortification resembling a star in shape and for that reason called the Batteria de la Estrella. Though the guns are chiefly of an old-fashioned type, pointing directly toward the sea, they are capable of being used with considerable effect against vessels attempting to force an entrance.

The neighborhood of Santiago is particularly rich in minerals, especially iron and copper; but the Spaniards have themselves done little to develop the mining industry. This has been left to American enterprise. From Punta de Sol, a little to the left of the magazine $1,500,000 worth of copper ore was annually shipped to the United States, as far back as 1830–1840, from the celebrated Cobra mines. But the mines have been closed for some time, owing chiefly to differences between the corporation which laid the railroad to the mines and that owning the mining concession. While these contending parties were haggling over freight rates, the mines became filled with water and had to be abandoned.

A far more satisfactory evidence of American enterprise and engineering skill is afforded by the immense iron pier of the Juruqua Company. This cost $200,000 to construct, and has facilities to load two 3,000-ton steamers with ore in less than 10 hours. The ore, which is brought down from the mines, some 15 miles away, on railroad trucks, is very rich, containing from 65 to 68 per cent. of pure iron. Most of it has been sent to the Bethlehem, Steelton, and Sparrow Point Companies in the United States. Just before the war broke out trial shipments of ore had been sent over to England, and strong hopes were entertained of establishing an extensive trade. The Spanish-American Iron Company, whose mines are at Daiquiri, a few miles to the E. of Juruqua, also exported large quantities of ore.

One of the best features of the place is the Alameda, the road extending along the water front for about half a mile, which has a good surface adapted for cycling, and is shaded by a boulevard of waving palms and choice trees. At the E. end is a very pretty botanical garden. About midway down the Paseo is a charming rustic pavilion, directly opposite the pier which leads to the comfortable quarters of the Club Nautica. Both the club and the improvements to the Alameda are chiefly due to the efforts of a German resident, Mr. Michaelson, of the banking house of Schumann and Co. The Spaniards were so intent on personal gain that no time or money could be spared for public improvements. There was no hotel in the city at which a self-respecting tramp would accept free accommodation. A couple of years before the war, therefore, a few Englishmen and Americans met and formed an alliance, the result of which took definite shape in the establishment of an Anglo-American Club. Without exception travelers declared it supplied the best cooked meals and was the cleanest and most comfortable stopping place for foreign travelers and residents in the West Indies.

The old cathedral forms the E. boundary of the Plaza de Armas, where on Thursday and Sunday nights it was the custom of the citizens, and especially of the pretty señoritas, to promenade while listening to the music of the military bands. The Government House and the Club San Carlos are also in the Plaza. The latter club was a regular rendezvous for Cuban patriots. In speaking of the principal city buildings, mention must be made of the large military barracks and hospital on the hill to the N. W.; nor will it do to forget the theater in which it is claimed Mme. Adelina Patti, at the age of 14 and under the direction of Gottschalk, made her début on the public stage. The same claim, however, is made for the theater of San Juan; but it may be that both places were visited on the same tour.

On the right side of the bay, toward the mouth, is a place used by the government as a coaling station, and known as Cinco Reales. On the opposite side of the bay near a mangrove swamp was a building used as a convalescents' hospital for the Spanish soldiers. This, with the exception of a number of pretty villa residences on the hillside near La Cruz, brings to a close the list of objects that would engage the visitors' attention on first entering the harbor, of course excepting the ancient capital itself. Houses with blue and yellow walls are piled up the hillside, here and there a quaint tower and turret showing or a stately palm. As a background the magnificent heights of the Sierra Maestra appear, assuming in the early morning the peculiar purple color seen to such effect on the Blue Mountains of Jamaica. Not only to the N., but E. and W. also, tall mountains raise their heads around the hill on which the city stands, forming thus a vast amphitheater of nature, with the blue waters of the bay as a foreground. To the right of the city toward La Cruz is a small fort called Punta Blanca, taking its name from the bank of white sand on which it rests. On the hills above were several small blockhouse forts. The harbor front has several wharves, but only vessels of light draught can come alongside. The Spanish authorities were talking for years of constructing a stone jetty and, by dredging, obtaining a depth of from 17 to 22 feet, in order that many vessels now lightered might unload

Santiago

direct on the quay; but scarcely more than a start was ever made.

Conditions on American Occupation.—On the assumption of control by the American government, July 17, 1899, of that portion of the province of Santiago included in the surrendered territory, industries were practically at a standstill. In the rural districts all industries were at an end. The estates, almost without exception, had been destroyed, and no work was being done. Such foodstuffs as were being produced in the territory were the work of certain men of the Cuban army who were detailed for this purpose, in order to furnish such corn and vegetables as it was possible to secure for their friends in arms. On the seaboard and near some of the large towns large sugar estates were dragging on a painful existence, producing from one-third to one-tenth their normal crop. They considered themselves fortunate to have saved their machinery and buildings from destruction. In order to do this they had been compelled to pay both Spaniards and insurgents, and it was not an unusual thing to find small parties representing each force in the immediate vicinity of the same plantation. Their cane fields had been largely destroyed and the cane had become overgrown with weeds, brush, etc. Those individuals who were engaged in the raising of cattle had lost everything and it was difficult to find a cow or an ox. Horses were few and in wretched condition. Mining had ceased; all industries were practically dead. Every man who could manage it had a tiny garden, which furnished very limited subsistence. This he supplemented with such wild fruits as he could gather.

In the towns the effect of reconcentration was shown by large crowds of women and children and old men who were practically starving. They were thin, pale, and barely able to drag themselves about. The merchants and a few planters were the only prosperous people in the province. The stores all seemed to have a fairly good stock of goods, and to have been protected during the war. Their transactions at first were extremely limited, as people were without money or other means of barter. Hospitals were horribly overcrowded and practically without supplies of either food, medicine, or clothing. The same was true of the charitable institutions for children and old people. In the country towns a condition existed bordering closely on starvation. There was no work and no one with money sufficient to start in on work of any consequence, except a few large planters already referred to. Spanish money was universally in circulation, silver being worth about 50 cents on the dollar and the centen $5. The amount of money in circulation was extremely limited. Wages were at that time from 60 to 80 cents a day, Spanish money, for ordinary laborers, and from $1 up to $2.50, Spanish, for skilled mechanics. Such railroads as existed in the province were largely crippled by the destruction of bridges and rolling stock, and greatly in need of repairs, which had not been attended to during the war. On the different country roads and highways the bridges had been entirely destroyed, either by blowing them up or by burning them.

A feeling of bitter hostility existed between the Cubans and Spaniards, and also a very ugly feeling between the Cubans who had acted in harmony with the autonomists in the latter days of the Spanish occupation and those who had been in the Cuban army. At first there was a good deal of talk of a threatening character in regard to what the Cubans would do to the Spaniards, now that they were in a position to avenge themselves for some of the many injuries received in the past. This, however, soon passed over, and much more friendly and sensible ideas prevailed. There were no schools and no material for establishing them. All officers of the civil government had resigned and left their posts, with the exception of one judge of the first instance and several municipal judges and certain police officers. The prisons were full of prisoners, both Spanish and Cuban, many of them being Spanish military and political prisoners. The administration of justice was at a standstill. The towns all presented an appearance of greatest neglect, and showed everywhere entire disregard of every sanitary law. The amount of clothing in the possession of the people was very limited, and in many of the interior villages women were compelled to keep out of sight when strangers appeared, as they had only skirts and waists made of bagging and other coarse material. Many of the children were absolutely without clothing. Evidences of great suffering were found on every hand. A very large proportion of the population was sick in the country districts from malaria and in the seaboard towns from lack of food and water. The death rate was extremely high throughout the province — in Santiago city over 200 per day.

The question of reaching the people throughout the province was a somewhat difficult one. It was solved, however, by sending the food to all the seaport towns and to such interior towns as could be reached with pack trains. Couriers were also sent through the country to notify the people where it could be found. Medicines and clothing were also issued in as large amounts as possible. Garrisons were sent to all important points with the purpose of restoring order and protecting those who wished to work, and the reëstablishing of

Santiago

the rural guard was commenced for the purpose of furnishing proper police protection in the interior districts. Medical officers were sent to the interior with these trains loaded with supplies, with instructions to do all that they could to relieve the sick and prevent the spread of disease. Strict orders were given to the rural and municipal police to treat robbers and others severely. Comparatively little disorder existed. The good behavior of the people was quite remarkable under the circumstances. Custom officers were appointed and every port of any consequence was soon put in charge of a collector, assisted by a force of native clerks, most of whom had had previous experience in the custom house under Spanish rule. The courts were gradually reorganized and supplied with necessary personnel and material. The prisons and jails were carefully examined, and all political and military prisoners were, as a rule, released. Rations were given freely to those unable to work; to those having families able to work, they were given in payment only for labor. The amount of rations issued was very large. The civil government was gradually established, mayors and municipal officers being appointed for the various municipalities. These officers were always nominated by a committee of the best people and were efficient as a class. Such public work as the American authorities had means to undertake were undertaken, not only for the purpose of public improvement, but for the sake of giving men work, with the proceeds of which to support themselves and families. Lighthouses were reëstablished, a new one built at Guantanamo, and the one at Santiago put in working condition. Commanding officers in all parts of the island were busily engaged in cleaning up towns and carrying out all possible sanitary and administrative reforms. Schools were established, some 60 in the city of Santiago and over 200 in the province as a whole, and the betterment of educational methods was energetically promoted. Pop. (1907) 53,614.

Santiago, Military Campaign of. The two striking facts in the war with Spain were the preparedness of the navy and the unpreparedness of the army. Both facts were mainly due to causes that had been in operation for years, for no attempt had been made since the Civil War to put the army on a really effective fighting basis; while after 1883 under Secretaries Chandler, Whitney, Tracy, Herbert, and Long, the navy had been steadily built up. The difference was partly due also to the fact that for months before the outbreak of war, preparations had been going on in the navy in anticipation of the event, while the War Department had done nothing till the war was upon us. It was then entirely too late to make up for lost time. The ships of the navy had been gathered from the distant seas and assembled in three fleets long before the scattered battalions and companies of the army were even put in motion toward the camps of assemblage. Battleships and cruisers had been trained for months in squadron evolutions under commodores and admirals, while not a general in the United States army was exercising so much as a major's command. The auxiliary ships of the navy had been practically all purchased and fitted up before the effort to purchase similar ships as transports for the army began. The ordnance bureau of the army was fossilized; that of the navy was doing splendid work. The quartermaster's and commissary bureaus of the army were unfortunately under the control of officers who were entirely separated from the line, and both bureaus broke down when the strain came. The medical department was in a similar plight. There was no good organization, no general staff, and no proper subordination, there being no proper division of the duties of the secretary, the adjutant-general and the major-general, who was in nominal command of all the forces. The field artillery were equipped with black powder and slow-firing guns. The men had but little practical training, and the battery commanders were for the most part old. The engineers were a highly trained body of men, able to do admirable work in civil engineering, but they were not used to rough field work of the kind to be encountered in war. Against all the defects there was one offset, namely: the splendid fighting capacity of the officers and enlisted men of the cavalry and infantry. The cavalry and infantry were well armed with good, modern military carbines and rifles which they knew how to use, and they had been well drilled in field work, though only in small bodies. The elder officers were relatively much less good than the younger ones, for, though some of them had kept their vigor and force, others had completely rusted; but the junior captains, the lieutenants, the non-commissioned officers and the rank and file formed as splendid a body of fighting men as could be found in the world.

The real responsibility for the shortcoming lies with those — and especially the legislators — who refused throughout long years (as some even yet refuse) to provide an adequate army. Every senator or congressman who refused to vote for a fair-sized army, who refused to vote the means to properly exercise that army, and every newspaper that upheld such a cause, must share the guilt of all that befell in the way of evil during the war, just as all who interfered, as in 1900, with our having the army raised to the proper size, will stand as the real authors of any disasters that may hereafter befall our army in

Santiago

the field, as the real cause of any national dishonor or disaster. The votes of these men, recorded in the journals of the two houses at Washington, will stand as a roll of dishonor.

No effective plan for the use of the army had been made in advance, and in the actual event whatever it did, merely followed the action of the navy. When Dewey destroyed the Spanish fleet at Manila, an army corps was sent to the Philippines, and when Cervera shut himself in Santiago harbor, another army corps was sent there, so as to ensure the fleet falling into Sampson's hands. The larger part of the small regular army of the United States, or at least the larger part of the cavalry and infantry, was gathered at Tampa, Fla., together with a number of volunteer regiments, to be ready for descent upon Cuba. Tampa was a poor choice in some ways, the climate in summer being almost as trying as that of Cuba, while the facilities for gathering troops and stores were poor in the extreme; It was the terminus of a single track railway which speedily became choked to the point of congestion with men and material of war. It would be difficult to overstate the weltering chaos of the Tampa yards.

General Miles was in command at Tampa, but General Shafter was put in command of the expedition. When it was definitely known that Cervera's fleet was in Santiago harbor, blockaded by Sampson's fleet, the proper objective for our army was at once clear. The Bay of Santiago is completely landlocked and is entered by a narrow, winding channel, running between high precipitous shores. There were Spanish batteries on the shores. There were Spanish mines in the channel. Only dire need would have justified an attempt by the warships to force an entrance where the chance of disaster was so great. This dire need could never arise if a good and well-handled army was sent against the city itself; and accordingly the War Department decided, quite properly, to send an army thither. It could not make up its mind quite when the army was to go, till, misled by a report that the city was already practically battered into submission by the fleet, it suddenly decided to hurry forward our forces in order to take possession. I doubt if anyone realized the serious fighting that was ahead, though the effects of disease were more or less anticipated, but not provided against. In view of the presence of the Spanish fleet in Santiago harbor, it would, of course, have been folly to defer operations till cool weather. It would have been much to our advantage had war been declared the preceding fall, but as things were, the need of bringing matters to a conclusion outweighed the danger of disease.

The decision to sail immediately was reached in a great hurry and word cabled to the generals at Tampa that they must embark next morning. It was late in the evening when the order was received, and a night of utter confusion followed getting the troops down to the quay, which was 9 miles away. The expedition included about 16,000 men, chiefly regulars. There were also the 1st United States volunteer cavalry, eight troops strong; and the 6th Massachusetts and the 71st New York infantry. Two Washington regiments, an Illinois regiment, a District of Columbia regiment and another Massachusetts regiment with some other corps joined later. There were several regular regiments of cavalry along, each of eight troops, the 1st, 3d, and 6th being white, and the 9th and 10th colored. These were all dismounted, but some of the 2d cavalry were mounted to act as orderlies. There were some 18 regiments of regular infantry and a few field batteries. The supply of mules and wagons was utterly inadequate for a serious campaign. The men were unsuitably clothed, having exactly the same garments that they would have worn in the Klondike, and the food was also unsuited for a tropical climate. The loading of the transports was accomplished in utter confusion, without any system whatever.

The transports were overcrowded. It was expected, however, that they would get under way at once, thus minimizing the length of time the troops would be aboard, and therefore, their discomfort. As we were on the eve of starting, however, word was brought by the naval commander of one of our small scout boats that a Spanish squadron had been seen off the Florida coast. This information naturally produced consternation at Washington. Nobody was positive of the whereabouts of all the Spanish ships. It was certain that most of Cervera's squadron was in Santiago harbor, and most of the remaining Spanish ships of the Atlantic fleet in the Spanish ports; but there was a bare chance that there were some ships unaccounted for, and if this was the case, the convoy would be in great danger. Accordingly word was wired to hold the transports where they were while our war vessels scouted for the supposed enemy. It took some five days of this before it was developed that the alarmist report was not warranted by facts, the officer having mistaken our own ships for those of the enemy. Meanwhile the transports swung idly at their anchors in shallow Tampa bay, the pitch bubbling in the seams under the intense sun rays. The travel rations were good, except in two important particulars. The meat issued consisted of what was called "canned roast beef." This was unsalted and at the best insipid, while at the worst it was positively nauseating. The men could eat but little of it. Moreover,

there was not a sufficiency of vegetables, while the water was poor and there was no ice for the men. No provisions had been made for cooking. With few exceptions the men were clad in the ordinary blue uniform with heavy shirts and underclothes, a costume much better suited for Manitoba than for an expedition in the tropics.

I have commented very strongly upon the general superiority of the management of our naval as compared with our land forces. It is but fair to say that in the Santiago campaign the navy was partly responsible for some of the hurry and unpreparedness at one time, and for some of the delay at another. The report of the scouting officer above mentioned had its share to do with the latter. As for the former, one cause of the hurried embarkation of the troops was the receipt of a telegram from the American admiral off Santiago stating that he had silenced the works and continuing as follows: "If 10,000 men were here, city and fleet would be ours within 48 hours. Every consideration demands immediate movement." It is true that the admiral who both before and after this rendered service second only to Dewey's, had a plan of campaign which included for the work of the army the taking of the forts at the mouth of the harbor. It is possible that this might have been done within a comparatively short space of time, and as in this case the army would have been close to the sea coast, there would have been less difficulty about transportation and less need of a greater number of troops. As it turned out ultimately, the course actually followed made the victory far more complete, as it resulted not only in the capture of the fleet and the city, but in the capture of the hostile army also, as the city was surrounded and attacked from the landward side. In any event, the sending of such a dispatch was assuming a grave responsibility, for it could not but convey what was, as events proved, an entirely erroneous idea of the magnitude of the task and the defensive power of the Spanish garrison. Moreover, the ship captains had themselves been misled by the ease and impunity with which they silenced the forts, into the belief that they had crippled them. As a matter of fact, they hardly did any real damage and the defenses were in practically as good shape as ever. The troops actually sent were, of course, abundantly fitted with everything necessary for a 48 hours' campaign, or even for one twice as long, and they had boats enough with them, taken in conjunction with those of the fleet, to permit the speedy landing of these men, with provisions enough to carry on their backs for three days. They did not, however, have boats sufficient to land all the stores aboard in any reasonable time, and they had no transportation adequate to taking these stores to the front, when once the army was encamped at any distance from the coast.

Santiago

It was June 9 that we received the order to embark. It was June 14 when we finally weighed anchor and started down Tampa bay. Next day the convoy put to sea and sailed S. E. between the Tortugas and the Florida coast. There were about 30 transports and some 16 warships, ranging from the great battleship "Indiana" through cruisers and gunboats to the swift, delicate, little torpedo boats. The transports were drawn up in three columns, and, of course, the speed of the whole was regulated by that of the slowest; so that it was very slow indeed. It was an impressive sight, especially at night, when the long rows of lights gleamed ahead and behind for miles and the warships kept signaling to one another. We were favored by fine weather and pushed steadily E. while the trade wind blew in our faces. The sky was a bright blue overhead and the waters beneath were a wonderful indigo.

The transports should have been under the control of the navy. Trouble arose now and then with their commanders, who were, of course, responsible to the shipowners for the safety of their vessels and who had nothing to gain by taking risks. Moreover the military men in command had no idea of what was or was not needed to ensure the safety of the convoy. Thus when one of the transports, which was towing a schooner, dropped behind, another transport was actually sent back to accompany it; the only effect being to give the rearmost war vessel two ships to protect instead of one. The warships kept a most vigilant lookout, and neither by night nor by day did they permit any stranger to come within danger distance. I think, however, that most of us who were aboard realized that after nightfall a swift and daring hostile warship, willing to take chances, could, in all probability, have slipped into the middle of the fleet unobserved, and have wrought great havoc among the clumsy, helpless troop-ships, swarming with men.

It was June 19 before we reached Inagua Island. Up to this time only the generals had known whither we were bound, and there had been a good deal of speculation among the regimental officers whether it was for Porto Rico or Santiago; but after sighting the lighthouse on Inagua, the fleet turned sharply toward the S. W. and steamed steadily through the rolling seas, with the trade wind aft, and the S. coast of easternmost Cuba on the right hand. All the following day we coasted along not far from shore, high barren-looking mountains rising almost from the water's edge, while the low country was broken and covered with thick jungle. It was a very difficult-looking country for an offensive cam-

paign. About 150 years before an English fleet and army had attempted what we were about to attempt, but had failed signally, the fleet being unable to force an entrance into Santiago harbor, while the army, after disembarking (not far from where we intended to disembark), was unable to advance through the jungle-covered country, and finally reëmbarked. However, nobody had any foreboding of failure or indeed of special difficulty. The Spaniards had shown such lack of enterprise, and their gunners had been so completely unable to do any damage to our ships, that, unmindful of the lessons of Spanish history, especially in the Peninsular War, we did not anticipate much hard fighting with the Spanish troops on shore.

On the 21st the fleet lay off Santiago harbor, while General Shafter and staff landed to meet the Cuban General Castillo. It was decided to make the landing E. of Santiago, and the so-called Cuban army was largely taken there in our ships, though some of it straggled around by land. The Cuban soldiers were almost all blacks and mulattoes and were clothed in rags and armed with every kind of old rifle. They were utterly unable to make a serious fight, or to stand against even a very inferior number of Spanish troops, but we hoped they might be of use as scouts and skirmishers. For various reasons this proved not to be the case, and so far as the Santiago campaign was concerned, we should have been better off if there had not been a single Cuban with the army. They accomplished literally nothing, while they were a source of trouble and embarrassment, and consumed much provisions.

The landing place selected was at the little ruined hamlet of Daiquiri, some 15 or 20 miles from the city of Santiago; very long miles however, when following a tortuous trail up and down hill through the jungle. It was an open roadstead, but as it was a shipping point for iron ore, and as the sea was comparatively calm, it was possible to land the army by the use of the small boats belonging to the warships and transports. There was a strongly-built iron pier extending out some distance from the shore, but too high above the water for use. The surf was sufficiently severe to prevent landing on the beach which was flanked by projecting rocky promontories. The boats, therefore, were obliged to land at the end of a small dock which extended some 30 yards out into the water. This dock had been partially burned by the Spaniards and the connecting walk between the end of it and the shore consisted of one or two loose boards on charred but heavy cross-ties. Naturally such a landing place offered but few facilities for easy disembarkation, and even to get the first two or three brigades ashore on the 22d taxed the capacity of the dock. Extraordinary to relate, the engineers never repaired it, and it remained as it was throughout the time of siege. Their work in bridge building and road building was not much better, whether through their own fault or because they could not procure enough laborers, I do not know.

Santiago

Before landing, the ships made feints along the coast to distract the attention of the Spaniards, and briskly shelled the woods and heights in our immediate front to dislodge any lurking enemy. A small force of the latter had held the place, but they left without striving to interfere with our landing. This was very foolish on their part, for the country offered absolutely unlimited opportunities for defensive work, and was the most difficult imaginable for offensive operations. The steep, jungle-covered hills made a hundred natural fortresses, and a very few hundred men, resolutely commanded, could have put a complete stop to the disembarkation, while even a few score could have inflicted severe loss with practical impunity. However, nothing of this kind was done, and when we landed we found that the Spaniards had fled, and that a swarm of practically naked Cubans had come in.

General Lawton was the first to disembark part of his division. There was very little order in the disembarkation, however — the different regiments getting ashore partly in accordance with the general plan and partly in accordance with the individual initiative of their commanders. General Lawton at once moved some of his troops to the front and established outposts, pickets, and scouting parties, well in advance. Several of the regular infantry regiments and the 2d Massachusetts disembarked, and General Young's brigade of Wheeler's cavalry division, including the 1st and 10th regular cavalry and the 1st volunteer cavalry. Camp was made wherever each regiment could find room, the men putting up their dog tents, or, more generally, sleeping out in the open — the officers all sleeping out in the open, as practically none of the officers' baggage was landed. The generals, Wheeler, Lawton, Young, and Chaffee, fared no better than the privates. General Wheeler having landed, was in command till General Shafter should come ashore, and as General Shafter was obliged to take very many of the transports with troops and stores further to the W. to the little town of Siboney to land, General Wheeler had the immediate direction of the movements for some days.

Landing the mules and the few horses proved difficult. The transports could not go near shore and the animals had to be flung overboard to make their way to the beach as best they could. Some were drowned. Enough were gradually gathered to make a few small mule trains.

Santiago

Next day, the 23d, the advance was begun. At this time the generals believed that the Cubans could be used, not merely as scouts, but in bush fighting in the front, and they were accordingly sent forward to find where the Spaniards were. They served the purpose of scouts well enough on this occasion, the Spaniards being found at a place called Las Guasimas, just at the hither side of the ruined hamlet, on the road to Santiago.

Under the direction of General Shafter, General Wheeler led the army toward Siboney, he himself going first. There he found that the Spaniards had left the blockhouses, followed by the Cubans who had engaged their rear guard and been repulsed. General Wheeler rode out in person toward the scene of the engagement, and, having satisfied himself where the Spaniards were and determined that there should be an attack upon them the next morning, he returned to Siboney.

Meanwhile by his orders the head of the army had taken up its march. General Lawton had brought forward the regiments of General Chaffee's brigade; and General Young's brigade, so far as it was landed, consisting of the two squadrons of the 1st volunteer cavalry and of one squadron each of the 1st and 10th regular cavalry, was marched to the extreme front. The march was not long but it was a trying one. The men had been cooped up for a fortnight aboard ship where it was impossible to take any exercise whatever. The road was a mere jungle trail and the heat intense. There were not a few stragglers. Naturally these were especially numerous in the 2d Massachusetts, a regiment of gallant men, who were unaccustomed to field work; but there were a number in the regular regiments. A noteworthy fact was that the cavalry walked quite as well as the infantry. It was after eight o'clock at night when the cavalry brigade reached Siboney and camped ahead of the infantry regiments. Each general was anxious to be the first to strike the Spaniards. General Wheeler being in command, allotted the task to General Young's brigade, the foremost of his own cavalry division.

General Castillo and a number of Cubans were at or near Siboney. General Wheeler consulted with him and General Young, and directed the latter to strike the Spaniards at Las Guasimas early the following morning, General Castillo promising his aid. General Young then sent for Colonel Wood of the 1st volunteer cavalry and arranged the plan of battle with him. From Siboney the main road to Santiago runs up through a valley and at its head crosses a spur of the great mountain chains toward the interior, and thence runs down hill to the city. Just where it crosses this spur it is joined by another trail from Siboney which runs along the hill crest to the left of it, that is, between it and the sea. General Young directed Colonel Wood to lead the two squadrons of the 1st volunteer cavalry along this hill trail to the left, while he himself with a squadron of the 1st and a squadron of the 10th regular cavalry, took the valley road.

Next morning the two small columns started before daybreak and after marching a couple of hours they struck the Spaniards. A sharp little fight followed and the Spaniards were driven from their position, though they were superior in numbers. At the sound of the firing, the infantry regiments who were nearest, started forward in great haste, as did one squadron of the 9th cavalry, the foremost of Sumner's brigade. The fight was over before they got to the front, however. This little brush put the men in good spirits and cleared the way to Santiago, the Spaniards not making another stand. Some 70 Americans and about 50 Spaniards were killed and wounded.

The next week was spent in getting the army within striking distance of Santiago, the camps of the regiments being strung out along the road from Savilla to within 3 miles or so of the city. There were available for the attack somewhat over 12,000 men all told, of whom 10,000 were regulars. The Spaniards in Santiago at this time numbered 6,000 troops, 1,000 of whom were sailors and marines from the ships. There were in the province of Santiago, all told, 23,000, and though great supineness had been shown by the Spanish general in gathering his forces, there was a body of 4,000 troops from the outside actually in motion toward Santiago.

Gangs of men were employed to repair the road from Siboney and make it passable for the army wagons which had now been landed and were in constant use bringing provisions to the front. The amount of transportation was utterly insufficient and the number of boats on the transports was also insufficient, though not to the same extent. In consequence, though there was plenty of food on the transports, the army was on salt pork and hardtack, generally without the full amount of coffee and sugar. In the afternoon there were usually heavy downpours of rain, such as are only seen in the tropics, which turned the road into a furious torrent and the camp grounds into morasses. The time was too short to permit of extensive development of fever, but cases began to crop out here and there. Gallant General Young was one of the victims and was obliged to go home.

There was very hard work for everybody during this week, the most efficient portion of it being done by the line officers and men of the infantry and cavalry. The fact that these showed to such advantage in this campaign when compared with the engineers

and artillerymen ought to be enough to show to even the blindest what, of course, really needs no proof, viz.: That it is the system which makes the difference between efficiency and inefficiency when men are equally good to start with. The officers of the engineers and artillery were certainly at the outset at least as good as those of the cavalry and infantry. In theory they were supposed to be better. But the cavalry and infantry were armed and drilled according to the most modern methods and had seen actual practice in the field. The engineers had not been trained in the field. The artillerymen were also without field training, and in addition they had slow-firing guns and black powder, the last making them hopelessly inferior to the Spaniards. The commissary department was under the immediate charge of Colonel Weston, and his energy, good sense and willingness to cut through red tape and take responsibilities, enabled those who came into immediate contact with him to do pretty well; but the quartermaster's department did badly. Too much cannot be said for the men, and indeed, for the beasts of the mule trains. The packers and the mules worked all the time in getting up provisions and ammunition. They were ravaged by fever, their ranks being so depleted that at one time a draft was made on the Rough Riders for 24 of their number to supply the packers' places. But all the efforts of the pack trains would not alter the fact that their numbers were too few. Nothing like enough transportation was brought along. The commanding general in his official report stated that there was ample transportation. This cannot be so, for if it were, the responsibility for the failure to bring up sufficient food to the front would rest with the general. No regiment had anything like the proper amount of transportation for its needs. Whether this was because the War Department failed to send enough, or because the commander of the army failed to use aright what he had, whether the shortage was inevitable or whether it was due to a faulty system, does not alter the fact that the shortage existed. The line officers had to work unceasingly to bring forward the necessary rations and to get transportation. They also had to mend roads, to reconnoiter the country ahead so far as they were allowed (for there was little reconnoissance) and to make rough maps.

The signal corps was unfortunately partly diverted from efficient work by the presence of an experimental toy — a balloon. This balloon accomplished nothing. There was little it could do in such a country as that in which we operated, for from hills it was always possible to see as far as a man in the balloon could see. In any event, even if the reverse had been the case, if half of the energy expended in getting the balloon at work had been expended in proper reconnoissance, we would have gained literally a hundred-fold the knowledge of the enemy's positions that was gained. Several wagons were employed in dragging to the front all the clumsy apparatus for sending up the balloon. If, instead of this, they had been employed in bringing beans to the front for the soldiers, the result would have been in every way infinitely better.

During this week all the troops which were intended for the actual assault on Santiago were brought to the front. General Lawton was encamped nearest Santiago with his infantry division of nine regiments, all of them regulars, excepting the 2d Massachusetts. Generals Chaffee, Ludlow, and Miles were under him; General Bates having an independent brigade. Following Lawton was General Sumner with his cavalry division of six regiments, all regulars except the 1st United States volunteer cavalry. Then came General Kent's infantry division of nine regiments, all regulars excepting the 71st New York, his three brigades being under Generals Hawkins and Wyckoff and Colonel Pearson.

Young's fight at Guasimas had been won so easily, the Spaniards had shown so little obstinacy, that all the army had become unfortunately confirmed in the belief that the task before us was light. This feeling of overconfidence was increased by the utter failure of the Spanish fleet to do anything, and by the want of aggressiveness on the part of their land forces. It was the old story of overconfidence, complicated with refusal to learn from the course of history. Ninety years before the Spaniards had been pitted in succession against the two greatest military powers of the day — England and France. At sea their navy had been the helpless prey of the English fleets; on land their armies had been scattered like chaff by Napoleon's marshals when they fought in the open; and yet their guerrilla warfare and their extraordinary defense of intrenched and fortified places (as at Sargossa and Gerona), had won the admiration of the civilized world. The fact that the Spanish ships were not effective fighting machines, and that their armies lacked aggressiveness and even firmness in the open, should not have been held to indicate that the Spaniards would not fight as desperately as they always had fought behind intrenchments. Moreover, we had been misled by the reports of those observers who had been in Cuba before the war. The best of them had not only underestimated the power of the Spanish garrisons to hold out when the Cuban coast was blockaded, but had wholly failed to understand the military value of the Spanish trochas, forts and blockhouses. A genera-

tion had passed since the Civil War and most men had forgotten how formidable intrenchments were, and did not realize the immense resisting power of even small blockhouses when attacked by infantry, unsupported or not properly supported by artillery. Accordingly the whole expedition was managed in the most happy-go-lucky manner. There was little evidence of foresight, forethought, or careful planning or of preparation in advance. The campaign itself was fought by the army on the every-man-for-his-own-hand principle. Even the numerical weakness of the Spaniards in the city of Santiago and their failure to concentrate the superior numbers which they had in the province, could not have prevented disaster, had it not been for the wonderful fighting qualities developed by the line officers and enlisted men of the infantry and cavalry.

On June 30 the advance was ordered. As we faced Santiago, the outlying town of El Caney, some 4 miles distant from the city, was on the right. This was held by the Spaniards in considerable force, and till it was captured we could not interfere with their water supply or with the districts from which they drew food. Accordingly it was resolved that General Lawton should attack and take the town, while the rest of the troops made a demonstration against the city to prevent reinforcements being sent out. The plan was not worked out well in advance and as no proper reconnoissance had been made, and as the resistance of the Spanish garrison of El Caney was utterly underestimated, the result was a fight along the whole line, in the shape of an assault by our army upon that portion of the Spanish defenses which was the strongest.

Chaffee's brigade, which was to do the heaviest fighting at El Caney, had bivouacked over night about a mile S. E. of the town, the men preserving strict silence and lighting no fires; the chief anxiety felt among all concerned was lest the Spanish might leave the town before there was a chance to attack and bag them. As a matter of fact, the Spaniards had not the slightest intention of leaving, and were preparing to put up as gallant and desperate a fight as the like number of men ever did put up. Captain Capron's four-gun battery of light artillery went with Chaffee's brigade. Miles' brigade was to the left, and Ludlow's close to the battery, in advance of Miles' brigade.

The brigades of Chaffee and Ludlow advanced shortly after five on the morning of July 1, Chaffee leading. The fight was to be opened by Capron's artillery.

The town was small, with a church and plaza, as in most Spanish-American towns, the houses having high sloped roofs of thatch. It was surrounded by trenches and by various blockhouses. At the S. E. corner, on a round knoll, was a loopholed stone fort with deep trenches outside. South of the town was a small blockhouse of wood, the lower portion, however, being banked with earth to the height of four feet. On the N. W. corner of the town was a similar but larger blockhouse. On the N. E. face was a line of intrenchments close to the town. There were intrenchments in the streets, and the heavier buildings were also used by the Spanish troops. A mile from the town on the side of the mountain was a very small blockhouse which on the day in question was attacked by the Cubans, who were repulsed. The next day some of the soldiers took it.

As the troops approached on the morning of July 1, the Spaniards could be seen lounging outside their lines. Above the little stone fort floated the red and yellow banner of Spain. The proceedings opened in a rather leisurely way, giving no promise of the desperate fight that was to follow. The Spanish soldiers, in their light blue-and-white striped uniforms and red-cockaded straw hats, looked with interest at Capron's battery as it was being wheeled into position, while the American troops, in their slouch hats, blue shirts, blue trousers, and brown leggings, marched forward into position. Neither officers nor men wore jackets, and all were dusty, sunburned, and for the most part unshaven. The Spanish soldiers had been for three years on the island and had seen much fighting against the insurgents. Half the American troops were raw recruits; of the remainder, few indeed had been under fire. But they behaved most admirably.

The action began about seven. Capron's battery opened fire. The Spaniards at once sought cover, and a quarter of an hour later Chaffee's brigade worked up close enough to begin exchanging shots with the trenches at about 1,000 yards. Fortified places and indeed intrenchments of all kinds should be reduced by artillery fire, either by itself or in combination with an infantry assault delivered when the big guns have prepared the way. Small stone forts and wooden blockhouses are peculiarly vulnerable to modern artillery. But unfortunately the American artillery could not properly be called modern. The black powder was a great disqualification, and partly through inferiority of design, and partly through lack of proper training among the officers and men, the fire was very slow and not very accurate; light guns can do little unless handled with exceptional vigor and skill, and but little vigor or skill was shown. The Spaniards should have been smothered by a very rapid and accurate fire. As a matter of fact, the shooting was slow, there were frequent pauses, and for quite a time the aim was very bad.

Meantime the infantry fight became murderous, especially as regarded the 7th and 12th regiments. This continued for about three or four hours, the artillery accomplishing nothing during this time. The American troops were pressed in to about 600 yards distance from the village and were then brought to a stop, though the skirmish line was edged cautiously forward. The fire was exceedingly heavy, but, whereas the Americans could fire at nothing but the white hats which marked the heads of the Spaniards in the trenches, the Spaniards, who knew the ground accurately, and some of whose sharpshooters shot very well, were continually able to take advantage of the advance of their foes and to fire at them when they were practically unprotected. Every move by a squad of men toward the Spanish line was greeted with a drove of Mauser bullets. The fullest possible credit must be awarded the Spaniards for their defense. They were outnumbered five to one, but they fought most gallantly and effectively. On the other hand, too much credit cannot be awarded the Americans for their courage in the attack.

To the 7th infantry fell the hardest task. They were deployed behind a low ridge fronting the stone fort, and were then advanced up to the crest. Immediately they were subjected to a terrible fire from their front and from the blockhouses, which were enabled to shoot at them from an angle. For hour after hour they lay flat on their stomachs under the intense heat of the sun, firing as occasion offered itself. Whenever one of them so much as raised himself on his elbows he became a target for the Spanish rifles. The grim, gaunt old Indian fighter, General Chaffee, realizing now the serious task before him, and entirely careless of his own life, walked up and down along and behind the lines, encouraging and steadying his men. One of his buttons was shot away and also his shoulder strap, yet he himself was not scratched, and continued to stroll to and fro, gripping his half-smoked cigar between his teeth. Three or four of the recruits becoming unsteady, began to fall back from the firing line toward a sunken road in the rear, but only to be pounced upon by Chaffee in person and driven back to the front under the flail of his bitter words. Most of the men, however, showed no symptom whatever of retreating. They lay stretched out at full length, their rifles at the ready, gazing eagerly toward the trenches for the chance to get a fair shot. At last a Spaniard would show himself, and instantly the soldiers who saw him would rise on their elbows or perhaps to their knees, fire, and once more stretch themselves at full length.

It would be difficult to single out men for special gallantry where all showed so much, but perhaps the bravest of the brave

Santiago

was Lieutenant Wansboro. He kept crawling on hands and knees along the extreme front of the firing line, cheering the men, and whenever a soldier was hit he would jump up, help take him to the rear, and then again return to the front. At last as he started up to go to the assistance of a man who had just been hit, a bullet struck him through the heart and he fell dead. He was taken to the rear by some of his own men, aided by Captain Arthur H. Lee, the British military attaché, a man who on that day showed as much gallantry and as little fear of death as any man in the American army. As they laid him under the shade beside a sunken road a non-commissioned officer quietly drew a handkerchief over the boyish face of the dead man and said: "Good-bye, lieutenant! You were a brave officer and you died like a true soldier."

This sunken road in the rear was the point to which the wounded were brought from the firing line beyond them. Captain Lee had come over to the line held by the 7th infantry about midday, and when he reached this road and saw it full of men lying down he remarked to an officer whom he met that he supposed these were the reserves. The officer replied: "No, by God, they are the casualties!" There were over 100 of them, who lay in silence without a whimper or a groan, the Spanish bullets clipping the leaves of the jungle trees close above their heads. The slightly wounded were attending those who had been less fortunate with great tenderness, and each man seemed to show the most thoughtful consideration for his fellow as they lay in the sweltering heat without a breath of air. Gorged vultures sat on the trees around them, seemingly undisturbed by the bullets, and when the firing lulled, one could hear the buzzing of the carrion flies and the uncanny rustling of the land crabs as they scuttled to and fro in the bushes. Each soldier had a first-aid-to-the-injured dressing and in some cases these had been applied, but hour after hour went by and no doctors could come up. They were stationed about three-quarters of a mile to the rear and were there kept so busy that they could not get to the front. Unfortunately, however, this meant that they were busy with the lightest cases, for the slightly wounded could walk to the rear, while the others could not.

The 12th regiment was also suffering very heavily. Two of its men during the forenoon performed an act of singular gallantry. They crept forward alone, armed only with wire cutters, and taking skillful advantage of the cover, passed along the whole E. front of the village not 200 yards from the Spanish lines, clipping the barbed wire fencing, which would otherwise have impeded the assault. They returned in safety

Santiago

from their dangerous task. Colonel Haskell had led the 17th infantry forward to deploy, but was himself hit three times and the regiment checked. It was withdrawn in good order and deployed to the right, where it rendered gallant service. Meanwhile Ludlow's brigade was closing in on the S. and W. sides of the village. He had with him two regular regiments, the 8th and 22d infantry, and one volunteer regiment, the 2d Massachusetts. The volunteers were gallant fellows, but they were armed with the black powder Springfields. Very early in the day they were struck by some long range volleys from El Caney, and halted and began to fire. Their cartridges, of course, sent out dense clouds of smoke, and as there was not a particle of smoke anywhere else on the firing lines, either of the Spanish or American infantry, this, of course, meant that they were immediately singled out as a target by every Spanish rifle. In a minute or two they were under such a heavy fire and were suffering so considerably that they were withdrawn from the fight, not having been able to render the slightest assistance. The fate of this regiment was a very severe commentary on the folly of the nation, and the supineness of the ordnance bureau of the War Department in failing to provide the best kind of modern arms for all our soldiers. The 8th and 22d, however, like their fellow regulars, had the Krag-Jorgensen, and Ludlow, an excellent officer, pushed these forward till they were hotly engaged; but, of course, at a great disadvantage, in spite of their numerical superiority, for they were in the open, while their opponents were in trenches or behind loopholed walls.

General Miles also brought up his reserve brigade from its headquarters at the great red-topped Darcoureaud house, and two of his regiments, the 4th and 25th regulars, were sent in to support Ludlow. At one o'clock no perceptible advance had been made. Hitherto the Americans had lost far more heavily than the Spaniards, and the latter were holding out as stubbornly as ever, while the expenditure of ammunition by the Americans had been prodigious. Just at this time an order was brought from General Shafter's headquarters to General Lawton to cease assaulting El Caney and move over to the help of Generals Kent and Wheeler at San Juan. To have carried out this order would have been disastrous in the extreme. It would have meant a demoralizing retreat in the very face of the enemy. Accordingly it was disregarded and the attack was pressed home, for Lawton was made of stern stuff. The battery was firing with renewed vigor and better aim and it began to make some impression on the little stone fort. Fiercer and more uninterruptedly rose the rattle of Krags and Mausers. The 12th regiment had been pushed forward close to the outworks and General Chaffee gave them the order to charge. At the word they rushed forward toward the stone fort, swarmed through and over the wire fences, over the trenches where the Spanish soldiers lay in heaps, their brains oozing out of the little bullet holes in their foreheads, and then into the fort, while the onlooking soldiers cheered frantically. Two newspaper men were among the foremost in this charge, James Creelman and Caspar Whitney, the former being shot in the shoulder.

Inside the fort the shattered walls were splashed with blood. A dozen dead and wounded Spaniards were lying on the floor, and about as many more, including a lieutenant, who were unhurt, had been taken prisoners. The prisoners, like almost all the Spaniards, firmly believed they were going to be killed. As a matter of fact, they were promptly offered water and hardtack by the victors; but still regarded the advances with profound distrust. The lieutenant, a handsome, well-dressed young fellow, looked both anxious and dignified till General Chaffee strode through the breach into the fort, shook hands with him, and then listened impassively to the excitable, brave little Spaniard, who, under the touch of kindness, promptly lost every appearance of reserve and chattered away about what had happened, constantly making reference to the "fortune of war."

The fight was not yet over, for, with desperate courage, the Spaniards still defended the town and the wooden blockhouses, and the men of the victorious 12th had to begin firing on them. Notwithstanding the end could not now be long averted. The other regiments of the three brigades were closing in, and as they reached the outer works the Spaniards retreated and the Americans at last got a chance to shoot at their foes in the open and to repay the losses they themselves had suffered.

The Spaniards had fought as bravely and as efficiently as any troops possibly could have fought. No men of any nationality could have done better. Now that their opponents were on even terms with them it was a simple impossibility for them longer to resist, and they streamed out of the N. W. end of the village. This was about four o'clock in the afternoon.

Considering the greatly superior numbers of the Americans (for Bates had just reinforced Lawton), it would certainly seem that troops might have been interposed to cut off the Spanish retreat; but as it was, the survivors were allowed to retire unmolested, returning fire for fire while they were in sight. One hundred and fifty of them were captured unhurt, and in addition to these between 300 and 400 were killed and wounded. The Americans lost about 400.

About 3,500 men were engaged on the American side all told, though the brunt of the fight was borne by only about a third of this number. About 600 Spaniards were engaged. The lesson taught is the very trite one that earthworks and intrenchments, sheltering unbroken infantry armed with high-power repeating rifles, can be held against very superior numbers of even the best troops, if the effort is made to carry them by assault. The Spaniards fought well and it would probably have been impossible to carry the village in less time or with less loss in the manner which was actually adopted, but a sufficiency of the right kind of artillery, properly handled, could have reduced it with very little loss indeed.

Soon after the fight was over the division which had taken El Caney was ordered to move up to the right of the dismounted cavalry at San Juan. The march was begun on the straight road from El Caney to Santiago. Both officers and men were utterly tired out and no precautions of the proper kind were taken either to scout in advance or to find out how serious any resistance that might be encountered was. After advancing nearly to their proper place in the line, the advance guard was fired on. As a matter of fact, there were no Spanish troops at the place where this fire was encountered save a few guerrillas, and it is even doubtful whether the bullets did not come from within the Santiago lines, whence at this time they were firing at Kent's and Wheeler's troops. But after the experience at El Caney there was a good deal of natural reluctance to make an attack against a foe of unknown strength, and there was a failure to try to develop the hostile strength by a proper reconnoissance. Instead of this the division was withdrawn and marched around all night by a circuitous route, so that it did not come into its proper position till the morning of the next day.

Over on the left wing the cavalry and Kent's infantry had been engaged in an even more desperate and bloody struggle. General Wheeler being sick, the two brigades of dismounted cavalry were under General Sumner. General Kent led the three brigades of his own infantry. All of them were regulars except the 71st New York volunteers. The original plan was that these divisions should leave their bivouac early in the morning, and while the artillery fired on the Spanish lines, the infantry and dismounted cavalry should march to the right and connect with Lawton's division. No proper reconnoissance of the ground in front had been made prior to Kent's taking matters in hand himself on the morning of the fight. The proposed bivouac of the foremost of Kent's brigades, Hawkins', was on ground which was actually well within range of the Spanish rifles, and the proposed line of march by which the troops were to connect with the infantry of Lawton led parallel to and within half rifle shot of the Spanish trenches. In the actual event the battle was left to fight itself, the division, brigade, regimental, and company commanders acting each according to his lights.

Santiago

The cavalry which was to take the advance was encamped in the neighborhood of El Poso, where we had placed a battery of light artillery. Early on the morning of the 1st this battery was in position on the crest of the hill behind which the cavalry brigades were gathering, together with some Cubans. When the sound of Lawton's guns announced the beginning of the fight at El Caney, the El Poso battery opened on the Spaniards. The black smoke hung thick and low, telling the exact spot to the Spaniards, and when they began to reply with their artillery the shrapnel which missed the American battery did considerable damage to the troops in the rear. Soon after this General Sumner marched his two brigades to the front. The balloon had been sent up with the idea of making a reconnoissance. What trifling information it thereby gained was more than offset by the fact that it was eventually anchored in front of the road by which Kent and Sumner's troops debouched for the attack on San Juan, and acted as a mark which enabled the Spaniards to locate their exact position.

This road was a mere muddy track through the jungle which formed a wall on either hand. Through this jungle it was quite impossible for troops to advance. The movement had to be by the road. The position of the road was, of course, well known to the Spaniards, and for at least a mile of its length it was within good range of the Mauser rifles carried by the soldiers who held the blockhouses and trenches we were about to assault. In consequence our troops, as they marched along, before they had a chance to deploy, were under a heavy fire and suffered a demoralizing loss.

General Wheeler was with the advance, but owing to his sickness was not able to take command of the cavalry division till about the middle of the afternoon, when the heavy fighting was over and the advance had almost ceased. Up to this time Sumner was in command of the dismounted cavalry. Kent exercised a command practically as independent as that of Lawton, though two of General Shafter's staff officers were with him. Lieutenant Miley, who was Shafter's personal aide, was at the extreme front all day. General Sumner himself led his division, the first brigade, in front. General Kent received orders to follow the cavalry, and his first brigade,

under General Hawkins, had to wait to let the cavalry pass and get in front. As is always the case when a long column marches down a narrow and rather difficult track, there was much delay. In places the road was broad enough to render column of fours the natural formation. Elsewhere it would narrow so as to make it most easy to go forward in columns of twos. This, of course, doubled the length of the column, and taken together with the occasional halts for getting rid of the packs, resulted in long delays for the troops in the rear, who fretted and fumed and were naturally unable to understand what was the reason for the halts. General Kent had his division drawn up with Hawkins' brigade in front, Wyckoff's brigade second, and Pearson's third.

Sumner, having brought his brigades across the San Juan into a comparatively open reach of tree-dotted grass jungle, turned to the right to march toward El Caney. Meanwhile General Hawkins had pushed forward opposite the cavalry column and made a reconnoissance in front. He was speedily joined by General Kent himself. They saw that the strongest position in their front was that occupied by the San Juan blockhouse. The Spaniards also occupied the slopes which, from where the general stood, lay on the left of the blockhouse. The left of this part of the Spanish line, opposite the right of the American, was on another hill, where there were some large ranch buildings and a huge iron kettle, because of which the soldiers afterward christened it "Kettle Hill."

General Kent rode back after his reconnoissance, and becoming impatient, pushed his infantry forward beside the two rearmost regiments of the cavalry division, the 10th and 1st. General Hawkins himself led the advance composed of the 16th and 6th infantry. His third regiment, the 71st New York volunteers, was handicapped by its black powder rifles, and moreover, was not well commanded. It accordingly hung back; but many of the officers and men behaved well and came forward in companies and squads, joining the regulars.

General Sumner's first brigade, as it marched to the right in front of the Spanish position, naturally attracted their fire and was finally forced to stop and return it. Meanwhile General Hawkins brought forward his two regiments of regulars and led them in person toward the San Juan blockhouse hill. The advance was through thick jungle — great patches of densely intertwined tropical bushes, vines, and trees, alternating with glades of the tall, rank guinea grass. The still, stifling heat made it terrible work for the advancing troops, and in such a country it was utterly impossible to preserve the regimental or even the company formations with anything like accuracy. No man could see more than a short distance, save from some unusually good point of observation, and in the advances no officer could personally direct men more than a few yards to one side or the other. In consequence the advance soon became broken up, less into companies than into squads, each captain or lieutenant and each natural leader among the non-commissioned officers bringing forward the little group of men he himself could rally. All movements in this jungle had been made in line or in single file. Only the simplest commands could be given or could be obeyed. But each officer and the enlisted men knew that what was demanded was an advance on the Spanish works.

As the men went forward the officers directed volley firing on the Spaniards on the hills. Not only did the jungle offer great obstructions, but there were barbed wire fences scattered along the foot of the hills. Meanwhile some of the American artillery had opened on the crest held by the Spaniards in order to help the American infantry, and still more effective assistance was given by Lieutenant Parker and his battery of four Gatlings, which he fought almost ahead of the infantry.

The foremost companies struggled through the thick jungle, reached the steep open slopes of the hills proper, and started upward, but in their first attempt were driven down again. By this time Sumner's whole cavalry division had been drawn fairly into the fight and had begun to advance, taking Kettle Hill with a rush. Once on top of Kettle Hill, they first of all turned their attention toward the San Juan blockhouse, firing volleys at the blockhouse and trenches so as to assist the infantry.

General Wyckoff's brigade was not able to get into action till some time after Hawkins had begun his advance. No sooner was it across the San Juan river than it suffered under a heavy fire. General Wyckoff was killed and the command then fell on Lieutenant-Colonel Worth, who soon fell severely wounded. The next in command was Lieutenant-Colonel Liscum who was also wounded not five minutes later; the brigade thus losing three commanders in a quarter of an hour. Lieutenant-Colonel Ewers then took command of it. The brigade struggled forward, and as it came up, Hawkins' regiments again charged the hill. This time they went to the top, two of Wyckoff's regiments accompanying, and the Spaniards were driven, and ran from their positions. Soon after the charge took place Pearson's brigade charged and took possession of the hills to the left, Hawkins' brigade having suffered most and Pearson's least. Hawkins himself was wounded not long afterward. The 13th infantry of Wyckoff's brigade had the honor of capturing a Spanish flag.

As soon as the infantry took the San Juan blockhouse, the cavalry on Kettle Hill started forward at a run against the second line of intrenchments on the hills in their front. The Spaniards fired on them for some moments, but did not wait the charge, most of them fleeing long before the Americans were at close range. A few fought to the last. From here the troops swung to the left till they reached the ridge crest overlooking Santiago, where they were halted. The cavalry were to the right and nearest the Spanish lines. As their flank was exposed, the 13th regiment of infantry was later sent over to hold the extreme right. An effort was made to fight the American artillery on the front line with the infantry, but the black powder rendered this effort futile. Every gun that attempted it was sooner or later driven off.

The battle had been largely fought by the captains, lieutenants, and first sergeants. Few colonels were able to exercise command over much more than a company. Generals Kent and Sumner did splendid work, the one in command of the infantry and the other of the cavalry. But from the very nature of the case, where an unplanned battle was fought on unknown jungle-covered ground, very much had to be left to the individual initiative of the troops themselves.

There were three brigades of infantry and two of cavalry, and of their commanders one, General Wyckoff, was killed, and two, General Hawkins and Colonel Carroll, wounded. Kent and Sumner, out of 6,500 men, had lost over 1,000 killed and wounded. Lawton and Bates had at El Caney over 5,000 men, though Bates' brigade and two or three of Lawton's regiments were not seriously engaged. The American loss of 400 at El Caney represented nearly as heavy a proportion of those engaged as was the case at San Juan. Lawton, a gallant and accomplished soldier, had won his fight as well and expeditiously as circumstances permitted. The individual acts of heroism were very numerous. Most of the loss at San Juan occurred before the advance was fairly begun, while the men lay in the stifling jungle grass, and the Mauser bullets seemed to go in sheets, rustling through the air and ripping up the ground. The hospital stewards took the wounded as fast as they rolled over and drew them back to the San Juan river, where they laid them in long rows under the bank. The generals and their aides were almost the only mounted men. The conduct of the wounded was extraordinary. They showed no selfishness and no brutality, never complaining and hardly ever grumbling, but waiting patiently for the few surgeons. As for these surgeons they worked all day and far into the night, till they literally fell asleep at their tasks.

Santiago

The American advance, when it did take place, was so quick that a number of Spanish sharpshooters were left in the trees. The foliage of these trees was very thick. The Spaniards were carefully concealed and used smokeless powder. The result was that it was exceedingly difficult to place them. They were under the impression that no quarter would be given them, and, consequently, they stayed in their leafy ambush, shooting down every man who came within range whom they thought they could with safety fire at. As Richard Harding Davis, one of the correspondents, was going to the rear carrying a wounded captain with the help of one of the Rough Riders, the latter was shot from a tree almost overhead. Several of the hospital stewards were shot in spite of the Red Cross brassards on their arms, and more than once the same fate befell men who were carrying the wounded to the rear. Many of the newspaper correspondents showed marked gallantry. James Creelman and Caspar Whitney at El Caney, and Davis and John Fox at San Juan, like Edward Marshall, who had been terribly wounded at Las Guasimas, behaved as bravely as any of the veteran fighters in the army. In the afternoon General Wheeler assumed command of the forces at San Juan. No further advance was attempted. The Spaniards had brought up all of their available reserves and at one time made an attempt at a forward movement, which was instantly repelled. During the rest of the time they kept up an exceedingly hot fire from both great guns and rifles. When dark came, General Wheeler gave the orders to intrench. The weary men had been all day long without food and had fought from early morning till dark. However, they set to work with pick and shovel and soon after midnight had completed a broken line of trenches across their position. Meanwhile there had been something very like a panic in the rear. As must always be the case in an army which has fought a hard fight, things at the rear looked very bad. There were wounded and stragglers and men who could not find their regiments, and other men who did not want to find them. The resistance of the Spaniards had been long and determined. General Bates had marched hard all day without being able to take any heavy part in the fighting. General Lawton, after nearly reaching the lines, had been fired on and had made a long circle before coming up to the right of the forces on the San Juan hills. Under these circumstances there was some gloomy talk of retiring. This would have been a fatal mistake. General Wheeler, however, put a stop to it. He was a veteran of the Civil War who had seen fights compared to which this was little more than child's play. He knew that the Spaniards, who had been driven back, must be in a far more shaky

Santiago

condition than the Americans, who had steadily advanced, and he had no intention of yielding a foot of ground to the rear. Nor did the proposal to go to the rear take more than a rather vague and tentative form. I wish to state with all possible emphasis that the men at the front, the men on the firing line, were never affected in the slightest degree by this talk of retiring, and, indeed, were for the most part ignorant of it. So far as I know not a single officer at the front so much as dreamed of the possibility of retiring and those who heard the rumor were equally angered and amazed.

There were two or three night alarms of Spanish attaeks, due to the enterprising nature of the Spanish pickets and sharpshooters who came up elose to our lines. Soon after dawn on July 2, the fight opened again, and all day long the musketry crackled and the big guns boomed at intervals. As on the day before, the black powder used by the American artillery put it at a hopeless disadvantage. Many of the Spanish guns were old muzzle loaders, but they used smokeless powder, and in consequence it was very diffieult to find their whereabouts. But there was one kind of wheeled gun which was fought right on the firing line with great sueeess. This was the Gatling. Four of these machine guns had been in the battle under Lieut. John H. Parker of the 13th infantry. Parker had taken his battery into aetion on the day preceding. He had hammered the earthworks at San Juan, while the infantry assaulted them, and had put the Gatlings on the extreme front with the cavalry division late in the afternoon. Two Colt's automatic guns and a dynamite gun belonging to the 1st United States volunteer eavalry were now put under his charge, and he used this motley battery with great effect throughout the rest of the siege.

During the main fight on July 1, the 33d Miehigan had been detaehed to attack Aguadores on the coast as a diversion. The attack was not pushed home and nothing was accomplished.

The fighting on the 2d was nothing but an exchange of firing between the trenches, nothing of consequence being aceomplished by either side, except that the American artillery with its blaek powder again showed that it could not remain within range of the Spanish rifles and had to be withdrawn to a commanding position well in the rear. Four thousand Spanish troops marched into Santiago. A couple of volunteer regiments were sent up to join the American lines at the front. Deducting losses this left about 9,000 Spanish troops inside the city and about 11,000 Americans outside at this time.

As is generally the case, each side exaggerated the strength of the other. The American commanders thought the Spaniards outnumbered their troops. One or two of the reports speak of the fact that there was "a little apprehension" of the Spaniards being able to make a successful attack on our lines. In the light of our after knowledge this reads rather funnily. The men on the firing line never felt the slightest anxiety about the Spaniards taking the initiative, and indeed hoped for nothing so much as that the Spaniards would make an attack, for this would have meant the immediate downfall of the city. Any attempt of the Spaniards to push home such an attaek against superior numbers of men, intrenched, espeeially when these men were better individual soldiers, would have resulted in disaster so great that the slightest energy in taking advantage of it would have meant the fall of the city.

Eaeh side was wholly ignorant of the designs of the other, and inelined to attribute to it plans of whieh it knew nothing. There was also a tendeney to speak of every outburst of firing from the trenehes as an attaek. These two tendeneies are responsible for the accounts of the alleged Spanish "night attaek" late in the evening of July 2. The insurgents had been burning blockhouses on the mountains. The Spaniards believed that these were signals between the insurgents and ourselves. We believed that they were signals between the Spanish garrison and Spanish reinforeements. Each side was on the outlook for developments, and when the Spanish piekets happened to come in contaet with our outposts a lively fire ensued which quiekly spread to the trenehes. At night it was far easier to tell the position of the Spaniards than by day, when the smokeless powder gave no sign of their whereabouts; for in the darkness the little spurts of flame were visible. The Spaniards did have an unusually large force of skirmishers out in the jungle between the lines, but their main body was in, or right beside the trenches and never moved from them. A tremendous fire was kept up for some minutes after it beeame general, but it was very ill directed, it being impossible to aim well at night, and what casualties there were happened in the rear, the fire for the most part going high. The best officers on the American side speedily realized the futility of wasting ammunition, and running up and down the lines gradually stopped the firing on our side. The Spaniards continued for some time longer, doing practically no damage; then their fire also died away.

Again that afternoon there was talk of retiring and again General Wheeler took the lead in putting a stop to it, thereby rendering probably the greatest single service rendered by any man in the campaign.

The following morning, the 3d, the firing went on much as usual, but by this time the American trenches had been perfected, and the men had grown used to the work, the

Santiago

casualties being very few. The Spanish sharpshooters, between the lines, displayed much boldness, and the guerrillas in the rear were still doing much damage, so details of sharpshooters were organized to hunt them down. A goodly number were killed that morning and several after the truce in the afternoon, for the guerrillas knew nothing of the truce and continued to shoot at our men. The truce took place about noon, a summons to surrender being sent in at that time. For a week the negotiations went on. It was not a truce all the time, however, for sometimes negotiations would be broken off, and the American troops would be notified to make an attack. During these intervals we would strengthen our lines and extend them by the right flank till we gradually completely invested the city. At the same time a mortar battery and additional artillery under General Randolph were brought to the front. No siege guns, however, were brought up, and the transportation was so utterly insufficient that never more than a day's food in advance was provided at the front. The rest was at the sea coast.

Inside the city of Santiago there was abundance of ammunition and food for the immediate necessities of the garrison, but there was no hope of ultimate success against the Americans. Disease might ravage the American ranks and bad weather cause great suffering by the interruption to the supply of provisions, but there was not the slightest chance of breaking up the siege operations. The resources of the United States were almost literally unlimited, and enough troops could be continually sent to the front to repair any losses, while there was no hope of the garrison breaking out or of reinforcements driving away the invaders. Sooner or later the food of the garrison would give out, and meanwhile, when the bombardment began in serious earnest, the time of unavailing suffering was sure to set in. The Spaniards had fought bravely; their cause was now hopeless, and they wished merely an honorable excuse for surrendering. General Linares, the commander-in-chief in the city, had been wounded, and General Toral had taken his place. On July 3 Cervera's fleet, which was in the harbor, and was the objective of the army, made a sortie and was destroyed. This put a final end to all hope of successful resistance, not merely at Santiago, but in the war. General Blanco, at Havana, and the Spanish home government wished to avoid the responsibility for the surrender, and cast it on Toral. Toral was equally reluctant to accept it. On the other hand, the Americans were anxious to get the city surrendered before a serious epidemic of disease should break out. But after eight days the parties were still unable to come to an agreement, whereupon negotiations were broken off, and on the afternoon of the 10th and the morning of the 11th the bombardment reopened. The Spanish reply was very feeble. General Randolph with his artillery completely silenced the Spanish batteries and the fire from the Spanish trenches was readily quelled. Another truce was declared and this time the Spaniards came to terms. It was agreed that they should surrender the city and be transported without their arms to Spain. On the 17th the American flag was hoisted on the works.

Throughout these days of peace and war in the trenches the troops showed excellent soldierly qualities. It was essentially a campaign of the regular army. Of the volunteer organizations along with them some did very well and some ill. But the great bulk of the work was done, and the great bulk of the loss was suffered, by the regulars.

The officers and men alike shared the hardship and fatigue, and the officers, as shown by their losses, and as was quite proper, took even greater risks than did the men under them. The lines were from time to time strengthened by traverses, and bomb proofs were put up under the hills. At night the trenches were pushed forward here and there. There was need for great watchfulness, as in places the hostile lines were not more than 400 yards apart. Zigzag approaches to the trenches were made so that the troops in them could be relieved every few hours of the day. At night pickets and Cossack posts were established in a cordon through the jungle and the most vigilant watch was kept in the trenches. Dog tents were brought up and put under the protection of the hills on the side farthest away from the Spanish fire. Rough field hospitals were established.

Fortunately, from the 1st of July to the 11th, when the last shot had been fired, the weather was good. During this period every effort should have been made to establish a depot of provisions at the front, but, as a matter of fact, nothing of the kind was done. The transports were still standing on and off in front of Siboney. There was a great deal of food on the beach there. The narrow jungle trail which led from there for 8 or 10 miles over the hills and across streams to the army received scant attention. The insufficient number of mules and wagons had all they could do to bring up ammunition and enough food to meet the needs of the army from day to day. In consequence there was always imminent danger of partial disaster. In good weather there was no trouble, but a single storm would render the road temporarily impassable, and a long spell of bad weather would have closed communications between the army and its base on the seaboard. Just after the last firing occurred there were two days of stormy weather. The road became

Santiago

an impassable quagmire and the streams torrents across which no wagons could be taken. Food at the front was short — one or two of the volunteer regiments being literally without any whatever. Fortunately the weather cleared and by great exertion matters were restored to their normal condition; but if instead of two days' bad weather there had been three, the damage to the road would have been such as to mean actual suffering from hunger of a marked kind on the part of the troops.

The condition of the hospitals was very bad indeed. There were not nearly enough doctors and the number of ambulances was utterly insufficient. A great deal of the trouble came from the fact that the stubborn and effective fight made by the Spaniards was a complete surprise. Before the battle of July 1 the general in command of the corps was reported to have told the surgeons to prepare to take care of 40 wounded men. As a matter of fact there were 1,200. There were only two ambulances for them and very few litters. There were but few surgeons, few hospital attendants, and entirely insufficient supplies. Many of the wounded went two or three days without any attention whatsoever. Some walked down to Siboney and got aboard the boats before they were cared for. Others were put into the hospitals and their wounds dressed, but were left without food or drink for 48 hours. The surgeons in charge did what they could, working till their eyes closed from utter weariness. The hospital attendants for the most part did well too, but they were all so overworked as to become peevish and irritable, and the immense amount of suffering they saw tended to make them a little calloused — at least in some instances. There were no cots, few blankets, and insufficient tentage. When a wounded man came to the rear he laid in the mud on his blanket, if he had one. If he did not have one, then he lay in the mud without it. In the most crowded hospitals many of the wounded were taken away from the operating table and put down in the high grass with no cover whatever, there to wait for perhaps 24 hours before they were found again. The astounding fact remains that from the wounds proper there was a very small death rate. The steel jacketed bullet, of minute size and high velocity, is anything but a lethal projectile. If shot through the heart, brain, or spine death was instantaneous; but if shot anywhere else the man usually recovered. Scores of cases of abdominal wounds which would have meant certain and painful death if inflicted by the old style rifle or by a shotgun were cured completely. One result of this was that a very large number of men who were wounded never left the firing lines, save for an hour or two to get their wounds dressed.

Far more trouble resulted from sickness. The army should have been moved N. just as soon as the city surrendered. The exposure, the insufficient tentage, and the improper food had severely shaken the constitutions of all the men. Half of them were more or less sick after they had been three weeks ashore and most of the remainder had lost a great deal of their snap and buoyancy. They suffered somewhat from dysentery and kindred complaints, but the arch foe was a persistent malarial fever of an acute and recurrent kind. This was not infectious, but unfortunately a few sporadic cases of yellow fever appeared and cast the home authorities into a panic. Various so-called experts examined the cases and speedily reported that nearly every man had yellow fever. The commanders at the front found that when a man was stricken down with fever, if he was kept in his tent or in a regimental hospital, he was able to return to duty in a few days, having merely suffered from severe malaria; but if he was sent to the rear, then his case was reported as yellow fever, and he was clapped into a yellow fever hospital. With this terror before their eyes the home authorities, misled by some of the reports they received, declined to take any steps to bring the army back to the United States, and as they were familiar neither with the country nor with the conditions and needs of the troops, they directed various plans to be carried out, not one of which was possible of fulfillment. The troops kept sickening and the percentage of men who were attacked by malarial fever kept increasing, while when once attacked, though a man might temporarily recover, he was sure to be stricken down again and again and to grow continually weaker. Under these circumstances the corps commander summoned a meeting of the division and brigade commanders, and it was unanimously agreed to make the most emphatic protest possible to the Secretary of War against the army being longer kept where it was, for no good end and to its certain ultimate ruin. The division and brigade commanders memorialized the corps commander to this effect and their protest was made public. The immediate result was to bring the army home, and about Aug. 5 the embarkation began. The voyage home was accomplished with little incident. There was no longer the slightest danger from Spanish cruisers, so the ships went separately and without convoy, each making its way as best it could.

The conditions on the first transports which had gone N. were terrible, owing to their crowded condition, and insufficient accommodations and lack of proper food, good water, and medicines. The most crying evils were to some extent remedied afterward, but the transport service in the main was bad. The men were all much

weakened, and in consequence the sick list on many of the vessels was appalling. Some of the ships were mere floating pesthouses. The water on some of them was bad, and on almost all the food was improper, chiefly owing to the fact that the meat ration, consisting generally of the canned roast beef, so-called, was at the best tasteless and at the worst nauseating; so that only a small part of it was consumed, even when the soldiers were very hungry. In healthy troops this merely meant a certain loss of strength; in sick troops it meant weakening them nearly to the danger point.

The returning army was gathered into a great camp near Montauk Point on Long Island. No thorough preparations were made in advance for this camp, in spite of the limitless resources of the country being available; but it was so near New York, and the chance for volunteer aid was so great that the most crying defects were speedily remedied. The hard work and good sense of the officers did the rest, and the camp was made as healthy as could possibly be desired. The fever had a firm hold on the men, and the malarial poison was so acute that the attacks occurred again and again. One of the sad features of the war was the number of men who died from disease after their return to their own country, and even to their homes. Some weeks went by before any notable improvement in the health and strength of the troops became apparent.

One feature of the campaign, that is, the attitude of a section of the newspaper press, should be mentioned. A perfect shoal of war correspondents started with the army. Many of them did admirable work. Many of them represented papers of dignified tone, which only desired to know the truth, and to tell it so far as it did not interfere with the success of the military operations. But there were some who represented papers which showed a very unwholesome inclination toward sensationalism, and an indifference to finding out the facts pure and simple, or to upholding the best interests of the country. The majority of the papers sought to find out the facts as they actually were; a few observed throughout an attitude of irrational optimism or irrational pessimism: but quite a number passed from one extreme to the other. During the early weeks of the campaign, that is, till after the heavy fighting had ended, the representatives of the last class apparently considered it to be almost treacherous to so much as hint that the troops were not always well led and volunteers not always in good shape to fight, or that the management of the various bureaus of the War Department was not always what it should be. Every volunteer regiment was given hysterical praise whether it did well or ill; every general called a hero bold, without regard to his acts; and every step in the matter of embarkation, transportation, and the like was chronicled as of inconceivable wisdom. After this period the very patent faults in organization and administration, and to some extent in leadership and conduct, were recognized, and soon the same papers took the opposite extreme, using quite as exaggerated language on the one side as they had previously employed on the other. The army was described as "starving to death at Camp Wyekoff" at a time when in reality there was a positive plethora not only of food but of delicacies.

A wise and patriotic historian must, of course, try to state the facts as they are; not only for the sake of the truth of history, but because of the need, from the standpoint of the nation, of learning aright the lessons history teaches. Americans need to have brought home to them the high quality of our regular army, and the indispensable nature of its services at the outbreak of any serious war. Volunteer regiments differ wonderfully in efficiency at the outset, and even more in the rapidity with which they learn their trade. The average American volunteer is brave, intelligent, and patriotic. I conscientiously believe that he can learn the trade of war more quickly than a similar soldier of any other country; but he has to learn it. Moreover, the nation needs to be taught that even the regular army can never show at its best unless it is sometimes exercised as a unit, and not as a jumble of small fractions. It should be sometimes drilled and maneuvered in mass; and sometimes the quartermaster and commissary, not to speak of the ordnance and medical departments, should be trained by actual experience in provisioning and supplying large bodies of men in the march and in the field. In short, the War Department must be managed on an altogether different basis from that on which it has been managed since the Civil War, if it is adequately to serve the nation's needs in times of crisis. But when all these disagreeable lessons have been learned from the experience of Santiago, there will remain the pleasanter lesson of successful heroism. There was a great deal of blundering and some inexcusable mismanagement, but as a whole the fighting edge of the officers and men was of the keenest and truest temper. The 5th corps at Santiago won a great victory in a marvelously short time and added a striking page to the honor roll of American history. THEODORE ROOSEVELT.

Santiago, Naval Operations at. Following is a description of the famous battle written by the late Admiral Sampson at the request of the publishers of this Encyclopedia:

Saturday morning, the 2d of July, at early daylight, the batteries at the entrance of Santiago and the Punta Gorda, a mile

within the entrance, had been heavily bombarded at the request of General Shafter, who had intended following up that morning his attack of the 1st, but this was not done, and the only result beyond some degree of injury to the batteries, was gun practice of an admirable sort. In the afternoon the chief of staff went to Siboney to arrange for a meeting of the commanders of the sea and land forces, in accordance with the wish of the government as well as of these officers themselves, for concerted action looking to carrying the batteries and forcing an entrance with the fleet. It was arranged that an escort should be at Siboney for the admiral the next morning. This next morning was Sunday, a bright and pleasant day, as most days were in front of Santiago, with less wind, however, than usual from the sea; the trades which blew usually well inland during the day, and sometimes very heavily and with a rough sea, being this day light.

Just before nine the flagship turned her head E. and started for Siboney under moderate steam, signaling to disregard the movements of the commander-in-chief. The several ships of the squadron were arranged much as usual (except that the "Massachusetts" and "Suwanee" were absent, having left about four the same morning for Guantanamo for coal), the "Gloucester" E. and well inshore, near Aquadores, then in succession and making a semicircle, with the Morro as a center, with a radius of about 4 miles, and all heading in toward the harbor entrance, the "Indiana," "New York," "Oregon," "Iowa," "Texas," "Brooklyn," "Vixen." The length of this arc was about 8 miles. When the "New York" started E. the "Indiana" moved somewhat into the position the flagship had occupied. The "Hist," which had wanted material for the mounting of an additional 3-pounder which the flagship was getting ready for her, and the torpedo boat "Ericson" accompanied the "New York" toward Siboney. The ship's company of the "New York" had just gone to the usual quarters for inspection at 9:30, and all the officers of the division had not yet reported when the Spanish ships were reported coming out of the harbor, and she at once turned. She was at this time about 4 miles E. of her usual position, but with the harbor entrance in plain view. She began to turn at 9:35, and fire had already been opened by our ships.

The "Iowa," which was the ship usually stationed immediately S. of the entrance, was by her position in a better place to observe the movements inside the entrance than others. The distance one could look into the harbor was about one nautical mile, this distance covering a narrow channel which takes a rather abrupt turn to the left (looking in) before reaching Punta Gorda, after which no more of the harbor

can be seen. Lieutenant Schuetze of the "Iowa," who as navigator had charge of the deck at quarters (all of the ships having gone to the usual morning quarters for inspection), observed a ship coming around this turn, and at once reported the fact, hoisting the signal, "Enemy coming out," simultaneously with the same hoisted by the "Texas." The first gun fired was a 6-pounder by the "Oregon," as calling attention to the signal and not as a shot at the enemy; the first hostile shot of the day being fired by the "Maria Teresa"; the first on our side by the "Iowa." It took but a few minutes for the "Infanta Maria Teresa" to cover the mile to the entrance, and she rounded to the W., followed by the "Vizcaya," the "Christobal Colon," and the "Almirante Oquendo," in the order named. Following the last, but at double the distance between the other ships were the deep-sea torpedo boats "Pluton" and "Furor."

All the enemy's ships at once took a W. course parallel to the shore, the water along which is very deep, so that it can be approached very closely. The American squadron at once closed in toward the Spanish ships and opened heavy fire, the general course of our ships from the situation being to the N. E., except the "Brooklyn," which being on the extreme W. of the blockading line, headed more to the N. After approaching shoreward some distance she turned with port helm to the E., making almost a circle, and then stood W. along with our other ships in a parallel course with the enemy; the "Oregon," which had from the offgo her full speed, rushing past her fellows and keeping pace with the best of the Spanish ships. The trend of the shore for 5 miles to the W. of Santiago entrance is with a slight circular sweep to the S., so as to form a shallow bay marked at its W. extremity by Gonzalez Point. The "Maria Teresa" and "Oquendo" at this point, and within 20 minutes of their leaving the entrance, were seen to turn inshore and to be afire; it took but a few moments for them to reach the beach, both of them quickly towering masses of flame, and they were driven head on into the narrow little bays of Nima-Nima and Juan Gonzalez, the "Teresa" with her bows but a few yards from the dry land, "Oquendo" grounding a little further seaward, with but a short half mile between the two.

In the meantime the "Christobal Colon" had, by keeping well inshore, escaped any material injury and had at a speed of perhaps as much as 16 knots drawn well ahead of the others, as had also the "Vizcaya." The "Pluton" and "Furor" following in the wake of their heavy ships, met the fire first of our battleships; the "Gloucester," which, by reserving her steam, had all her speed, gallantly came to close quarters with

them, and the writer has with one exception no more vivid memory of the fight than the "Gloucester," projected against a vast cloud of powder smoke from the ships ahead of her, engaged in, so to speak, a hand-to-hand conflict with these, her formidable adversaries. The dramatic effect of the scene was quickly intensified by the penetration of the boiler of the "Pluton" by a shell and the spurt skyward of a vast snowy geyser of steam, several hundreds of feet in height; both were rent to pieces and helpless; the one sinking near the beach, the other drifting ashore and in a day or so entirely disappearing by sliding off the almost vertical reef into the deep water. The loss of life in these craft was of a terrible character, not more than 50 being saved out of the 140 manning the two vessels. Shortly after this scene two men were passed in the water, to whom were thrown life buoys from the "New York," and in addition to the buoys, the small oak pulpit used by the chaplain, which was at hand in the passageway on the main deck, between the admiral's and captain's cabins. This pulpit had on it a wooden cross, and the captain's coxswain, in heaving it overboard, shouted: "Cling to the cross!" Curiously, the first man who had seized a buoy, an immense stalwart fellow, stripped naked, was lost; the second, to whom the pulpit was thrown, was picked up by the torpedo boat "Ericson." The situation at 10:40 had thus developed in an hour into two of these splendid cruisers being ashore and burning fiercely, the two torpedo boat destroyers themselves destroyed, and the "Vizcaya" and "Colon" still afloat — the former yet in action, the latter well ahead and using every effort to escape. The "Oregon," "Brooklyn," and "Texas" were in advance; the "Iowa," closer inshore, was in reach of the "Vizcaya," the "Indiana" shortly astern of the "Iowa," and the "New York" close to the "Indiana."

Twenty minutes later and the "Vizcaya" turned, jets of smoke starting from aft, and she stood toward the shore. The battle had carried her now 18 miles W. of Santiago, abreast the little harbor named from a former (but now destroyed) village, Asseraderos. She was from 1½ to 2 miles from the shore when she turned and stood in at low speed for the beach. Firing had ceased as she hauled down her colors; the "Iowa" had stopped, the "Indiana" had been ordered back by the flagship to the harbor entrance lest there might be still some force of the enemy within, which could come out and harry our army transports which were scattered up and down the sea for miles; the "Colon" was speeding W., and S. of her and astern were the "Brooklyn," "Oregon," "Texas," and "Vixen," in the order named, the "Brooklyn" farther seaward. The "New York" was well in-

Santiago

shore and directly in the "Colon's" wake, straining every nerve in the chase.

It was then, and in these circumstances that occurred what was to those aboard the flagship, the most moving incident of this most dramatic day. The "Vizcaya" was slowly crossing the "New York's" bows so near that every detail of movement could be observed aboard without a glass, the small jets of smoke aft had increased to columns, the crew had gathered forward, most of them motionless, but some few wildly rushing about. The crews of both ships were gazing toward each other; the one at the summit of elation in victory, the other silently undergoing the fateful strain of the fire and explosion of their burning ship. The "New York's" crew hushed into silence, and watched with mingled feelings of triumph and pity, as did also the men of the "Iowa" near at hand, this splendid ship going to destruction. She was quickly ashore, and by the time she had reached the reef, the flames were reaching the height of her mainmast. The "Iowa," "Gloucester," "Hist," and "Ericson"" had been left as rescuers as the rest sped on, and it was alongside these burning ships that some of the most daring work of the day was done. No risk was undared to save the men whom our own had brought to such straits, and all the afternoon amid explosions and flames the rescue went on, until some 1,100 men had been taken aboard our ships from the burning wrecks. The "Harvard" was fortunately at hand to receive the larger number. Long after passing the "Vizcaya," looking back could be seen vast columns of smoke, the result of explosions of the forward magazines of the "Oquendo" and "Vizcaya," and it may be mentioned as one of the strange and curious things, that the finding of the Board which rendered the verdict in the case of the "Maine," all the members of which were present at the action, could have had no more complete vindication than that given by the results of the explosion of the like placed magazines of these Spanish ships. But the "Colon" was still in full flight and all settled down to a long chase. By half-past twelve, however, there were signs of exhaustion and that she would not be able to much longer keep up her speed. At 12:45 the "Oregon" had drawn near enough to open with her 13-inch guns, first trying her 8-inch, which fell short, as did those of the "Brooklyn," which latter by this time had drawn onto the port bow of the "Oregon." The "Oregon" fired six 13-inch shells, the first at 8,599 yards, the second at 9,000, the third at 9,500, which went beyond the "Colon." The range was then reduced till at the end one was fired at 8,900 which struck near the starboard quarter of the "Colon." The "Brooklyn" in the meantime had begun firing her 8-inch

guns, her last shot being at 6,700 yards. During this firing the "Colon" had shown great uncertainty as to course, and had turned somewhat landward, when at 1:15, the shells falling beyond her, she turned directly in and hauled down her colors. She stood landward, and soon drove up onto the small beach at the mouth of the little river Tarquino, 48 miles from Santiago, and under the shadow of the highest mountain in Cuba, Mount Tarquino, 8,400 feet high. But she had escaped us after all; her crew of 525 men were ours, but her seavalves had been opened, and she slowly settled into the water. Her bow was driven up on the beach until it was in but eight feet of water, but her stern was in 70. As the tide rose, she floated at about seven o'clock, and began to drift off shore. A prize crew had been put on board from the "Oregon," and, as she floated off, both anchors were let go. It was clear, however, that if she were left as she was, she would sink in such depths that recovery would be impossible. It was determined to push her into shoaler water, and the "New York," putting her stem against her starboard quarter, pushed her until she was aground. Most unfortunately, however, as she sank later in the night, she turned over onto her starboard side, her port guns sticking straight into the air, and thus she lay, her port quarter only out of water. Much as we might wish to float her, the problem, from her position, was a trying one. Having turned so far, the tendency, were she floated, would be to turn still further, and there would be great difficulty in preventing her turning bottom up. Had she sunk naturally, the work of raising would have been a light one.

The aftermath of the battle had in it much of the tragic and something of the less serious. The tragedy was in the accompaniments of the rescue of the fated men from the burning ships carried out chiefly by the "Iowa," "Gloucester," "Hist" and "Ericson," and which showed up the kindliness and courage of our men in a supreme degree. Explosions were constantly occurring, loaded guns were going off in the heat, and there was no telling when the magazines would be reached and the ships blown to pieces. We had no precedent for the results of such explosions but the "Maine"; but when in the cases of the "Vizcaya" and "Oquendo" the forward magazines did explode, no such destruction ensued as in the case of our own unhappy ship; a telling proof, were one needed, of the truth of the finding of our Board upon the subject. The men were taken off mostly in a nude state, stripped for a leap into the sea; large numbers were wounded in a fearful manner and many were sadly burned — and there is no doubt that a large number of the wounded and, perhaps, some unwounded, were burned in the ships. When on board the "Oquendo" on the 5th of July, the forward torpedo compartment was found deep with the calcined remains of men; the torpedo had been exploded in its tube and it was supposed that it was exploded by a shell striking the plunger, thus wrecking the compartment and dealing the wide-spread death which was so evident. Two of the crew picked up the same afternoon from the beach, brought on board the flagship, fed and clothed, stated, however, the next morning, that the torpedo had exploded from the fire of the burning ship, and that the remains of so great a number of men were found in the compartment from the fact that it was immediately over the place used as an operating room, and that the men were largely the wounded who had crowded up from below and could go no further.

There is no need to harrow the reader's mind with the further details of suffering of these unhappy crews; all was done that could be done to treat them tenderly and kindly. They were transferred as rapidly as possible to the "Iowa," "Indiana," and "Harvard," the first receiving 38 officers and 238 men; the others about the same number. Admiral Cervera and Captain Eulate were among those received by the "Iowa." The former when taken off by the "Gloucester" had to be supplied with clothing much too small for him, but his advent on board the "Iowa" was none the less dignified and worthy the vanquished chief. He was received with the honors due his rank, and the crew of the "Iowa" gathered on her battlements, cheered him strongly and heartily — Eulate was badly wounded and severely shaken by the experience through which he had gone, but had been able to bring his sword with him which he surrendered to Captain Evans on the deck of the "Iowa," but which was at once returned to him. He has much of the dramatic tendency of a Southern race, and looking ashore before turning to go below he raised his hand and said "Adieu, Vizcaya," and as if in return for his farewell the forward magazine exploding, sent a vast column of smoke towering hundreds of feet into the air; a magnificent and impressive spectacle.

The less serious was the result of the appearance of the Austrian armored cruiser "Maria Teresa," whose coming had been heralded some time before, but whose advent at this special time was somewhat startling from the great similarity, at a little distance, of the Austrian and Spanish flags. Warnings had been sent out long before on this account, but so long that probably the matter had somewhat passed out of mind. The "Harvard" and "Resolute," sighting the Austrian, became convinced of her Spanish character and at once came W. to warn the fleet. The transport fleet off Siboney had been warned and they dispersed in all directions, a large convoy coming W. and

collecting under the lee of the "Iowa" and "Indiana" in a very evident state of terror as to what might happen — two, it is stated, did not stop till they reached Jamaica, a hundred miles distant. The captain of the "Iowa," finally convinced by the assurances of the other ships of the character of the newcomer, recalled his boats and prepared for action, which, had the stranger been an enemy would have been a serious matter with nearly 300 prisoners to hamper the ship. It was soon seen, however, that she and the "Indiana" were evidently on friendly terms and a halt was called to further hostilities. The "Resolute" went W. till she arrived about three o'clock at the point where the "Colon" had been beached. The "Brooklyn" was ordered to look after the strange ship, and it was intended to send also the "Oregon" but before orders were given the latter, the admiral concluded she was the expected Austrian. It was considered also that there were already two battleships, the "Iowa" and the "Indiana" to the E. which must have met her and which were certainly informed, and further action was dropped. The arrival of the "Resolute" was, however, very opportune, as she being fitted for transport service, relieved the other ships of the necessity of taking on board the 560 prisoners of the "Colon."

The "Indiana" had spoken the Austrian who had come down with her largest flag flying and with the international signal: "I am an Austrian." The latter sent an officer on board the "Indiana," who found the men still at quarters and stripped for action, the decks wet down and the ship covered with the deposit of powder from nearly 2,000 shots. He was informed that the ship had just been in action and that three of the Spanish squadron had been beached and burned. The surprise of the young officer was great and overwhelming, mixed possibly with some regret, as there was a natural leaning on the part of his nation toward Spain for many reasons; as ancient political connections, dynastic relationships and lastly in a much longer list of causes which might be named, the fact that the regent was a much loved and much respected daughter of Austria. There was no question of the anxiety of the new arrival to set himself straight and finally he arranged to keep 20 miles to the S. and out of reach of mistakes for the night. Next day when our ships were again all off the harbor mouth he reappeared under more reassuring circumstances, as did also two English men-of-war, all intent upon the removal of such of their respective subjects as wished to flee the repetition of the bombardment of the city by the fleet.

By nightfall the ships were well back to their stations, excepting the "New York," "Texas," "Oregon," "Resolute," and "Vixen," which were still concerned with looking after the "Colon" and her crew. The flagship started back at eleven, leaving the "Texas" and "Oregon" in charge of the burning ship and at 4 A. M. was again at her post, but now with the relief which came from knowing that the long strain was over and that there was no longer an enemy within to be expected seaward.

Thus the day closed, and with it, practically, the war. With her fleet gone, Spain was powerless. There were to follow a bombardment of Santiago, truces and negotiations, but there were no more assaults other than of cannon from the sea over the hills into the distant city. No completer instance of the determining effect of "sea power" could be given. As the captain of "Christobal Colon" said next day on board the flagship: "This ends the war."

There has been much criticism of Admiral Cervera's tactics, the question asked being: "Why did he not come out at night or, coming out in daylight, why did he not disperse his squadron?" Answering the first, he could not; the searchlight showing up the harbor entrance preventing it; it was too blinding to the pilot in so narrow a channel. Answering the second, the Spaniards knew we had but two ships, the "New York" and "Brooklyn," equal to theirs in speed, the one at the E. end of the line the other at the W. They expected to be able to run by our battleships before sustaining any material injury, and they would then have but one ship in the direction they took which could hope to cope with them, and this they reasonably supposed they could look after. The unexpected quick closing-in of our squadron, and the murderous effect of its fire upset these plans. All but one were quickly destroyed, and this one, the "Christobal Colon," was unable to sustain her speed. Many of her men had been ashore in the trenches on the 1st and 2d of July; they had just returned on board after much suffering from fatigue and hunger, and her steam thus gradually ran down. On the other hand our pursuing ships were increasing their speed. There was never any doubt at any time on the flagship of our ability to overhaul her.

Direction was taken to the W. in order, in case they could not hope to reach Havana, to take advantage of the great labyrinth of coral reefs, W. of Cape Cruz and of the harbor of Cienfuegos, 300 miles away. The scheme was thus not altogether the illogical one it has seemed to many. It failed only because the first premise was incorrect, and in that hour died Spanish sovereignty in the Americas.

WILLIAM T. SAMPSON.

Santo Domingo, a republic occupying the E. part of the island of Haiti, one of the Greater Antilles, West Indies. There are several mountain ranges running E.

and W., between which are large and fertile plains. The country is well watered, the most important rivers being the Yaqui, Yuna, and Ozama. The coast is irregular, having a number of deep indentations which afford excellent harbors. The climate on the coast is hot and in some sections unhealthful. In the interior it varies, being mild and salubrious in the more elevated districts. Area, 18,045 square miles. Pop. about 610,000.

People.— The population consists largely of a mixed race of the aborigines and the first Spanish inhabitants, and of negroes and mulattoes, the former being less in number. There are a considerable number of whites descended from Europeans. Owing to the influence of the latter the Spanish language prevails. French and English are spoken in the towns. In more recent years many Cubans have settled in Santo Domingo, and their immigration has been encouraged.

Religion and Education.— The State religion is Roman Catholic, though other forms of worship with certain restrictions are tolerated. There are in all 54 parishes. Primary education is free and obligatory. The public or state schools consist of primary, superior, technical, and normal schools, and a professional school similar to a university. According to the school census of December, 1884, there were 201 municipal schools for primary instruction, with 7,708 pupils. There are now about 300 schools with 10,000 pupils. Funds for the support of education are supplied by the communes and by central aid.

Government.— Santo Domingo is divided into six provinces and five maritime districts. It is governed under a constitution. The legislative power is vested in a national congress of 22 deputies, who are elected by popular vote. They are chosen with a ratio of two from each province and two from each district, and serve for two years. The executive power rests in a president, elected for a term of four years, and assisted by a cabinet of five ministers representing the heads of the departments of the Interior, of Police, Finance and Commerce, Justice and Public Instruction, War and Marine, and Public Works and Foreign Affairs. A governor appointed by the president presides over each province and district.

Finances.— The revenue is mostly derived from duties on imports and exports. In the year 1898 these duties amounted to $1,550,294. In 1895 the expenditures amounted to $1,351,250. In 1893 the custom house was taken in charge by the American Santo Domingo Improvement Company, which agreed to pay the interest on the foreign debt from March 1 of that year, to supply $90,000 per month for the budget, and to build with the help of the government, the railroad from Porto Plata to Santiago.

Industry and Commerce.— The principal occupation is that of sugar growing. Of later years considerable progress has been made under the impulse of American enterprise. The production of coffee, cocoa, bananas, and tobacco is on the increase, and important industries are connected with forestry. In the S. and W. of the country extensive factories and sugar plantations are in operation. The commerce of the country is small. In 1898 the imports amounted to $1,696,280, and the exports to $5,789,997. The trade is mainly with the West Indian Islands, the United States, England, Spain, Germany, and France. The principal exports in 1898 were sugar, mahogany, tobacco, coffee, cocoa, logwood, bananas, wax, honey, hides, dividivi, and rum.

History.— The early history of this portion of the island, which remained Spanish when the W. part was ceded to France in 1697, and which was united with the neighboring State in 1795–1808, and in 1822–1843, properly belongs to that of HAITI (*q. v.*). In 1843 it assumed a separate standing as the Santo Domingo republic, the anarchy and misrule of which it exchanged in 1861 for the despotism of its former masters. But the harsh Spanish rule brought on a revolt in 1863. The Spaniards were driven out by a force headed by José Maria Cabral in 1865, and the constitution of 1844, with a few changes, was reaffirmed. In November, 1869, Baez, the president, signed with President Grant a treaty for the annexation of Santo Domingo to the United States, but the United States Senate refused to ratify the treaty. A revolution broke out in 1903, and led the United States to send warships to the coast, and in 1907 the United States took charge of the collection of customs and payment of the foreign debt.

Santos=Dumont, a French aeronaut; born in Brazil, South America, about 1874; was educated largely in France, and on the death of his father, made his home in Paris. He was much interested in the problem of aërial navigation and devoted his time and fortune to the solution of the question. In 1900 he made several partly successful attempts to fly with his dirigible balloon; but it was not till 1901 that he succeeded in perfectly controlling his machine in the face of a strong wind. In September, 1901, he won the Deutsch prize of $20,000 for the navigation of a flying machine under certain conditions. See FLYING MACHINE.

Sao=Francisco, a river of Brazil, known in its upper course as the Paranpeba. It rises in the S. W. of the province of Minas Geraes, flows N. N. E. through that province and the province of Bahia, forms the boundary between the latter province and Pernambuco, and falls into the Atlantic 50 miles N. N. E. of the town of Sergipe del

Rey; length, 1,600 miles, with numerous rapids and cataracts, which make its continuous navigation impossible.

Saône, a river of France, rising in the department of Vosges. After a S. course of 300 miles, it joins the Rhone at Lyons. It is navigable for a distance of 170 miles below the city of Gray, department of Haute-Saône.

Sao Paulo, the most promising State in the republic of Brazil; area, 112,330 square miles; stretches from the ocean to the Parana river, and consists of a strip of coast land (8 to 80 miles broad) and an elevated region, the latter occupying all the interior, and rising from 1,600 feet; all this part is healthy, and the climate pleasant. The principal ranges are the Serras da Mantiqueira and do Mar. The rivers are numerous, and many of them of importance; regular steamboat service is maintained over a distance of 400 miles. The State possesses also 1,133 miles of railway. Its mineral wealth includes magnetic iron, gold, marble, and precious stones. There is some cattle rearing and a few manufactures; but the chief industry is agriculture. The principal crop is coffee; next follow sugar, cotton, tobacco, manioc, maize, and vines. The exports of the State — by either Rio de Janeiro or its own chief port, Santos — amount to some 40 per cent. of the total for the republic. Pop. (1900) 2,279,608.

Sao Paulo, the capital, is on a plain bounded by low hills; 4 miles from the Rio Tiete and 310 W. by S. of Rio de Janeiro. It has houses of one story, a handsome public garden, and tramways running out to the beautiful suburbs. The principal buildings are the old Jesuit college, now the government palace the bishop's palace, and a celebrated law school. Sao Paulo is the headquarters of the coffee trade, and railways connect it with the great coffee districts in the interior. There are cotton-weaving and printing works, and manufactories of tobacco, cigars, spirits, matches, gloves, and hats. Pop. (1906) 348,000.

Sap, the nutrimental fluid which circulates in plants. As it rises in the stem it is of a watery nature and contains the various inorganic matters absorbed by the roots, also some sugar, dextrine, and other organic substances which it has dissolved in its upward course. In its passage to the leaves it becomes more and more altered from the state in which it was absorbed by the roots; but when it reaches the leaves it is still unfitted for the requirements of the plant, and is hence termed crude sap. Through the action of the light and air it undergoes important changes in the leaves and other green parts, and becomes adapted for the nourishment of the plant. In this state it is termed elaborated sap. In dicotyledons this elaborated fluid descends through the internal bark and cambium layer toward the root, and is transmitted laterally inward by the medullary rays.

Sap, in fortifications, an excavated trench or tunnel, for the purpose of approaching a fort under cover of the scarp and parapet formed by the ditch and excavated earth. At the head of the sapping party a sap roller is pushed along as the sap advances, affording protection to the men. The sap advances by zigzags, so directed as not to be exposed to an enfilading fire from the fortification. Sand bags, gabions, and fascines are employed as revetments or to crown the parapet formed by the excavated earth. The double sap has a parapet at each side.

Sapajou, the name generally given to a group of South American prehensile-tailed monkeys, including 15 or 16 species. Among the species may be named the *Cebus fatuellus,* or horned sapajou (also called horned capucin); the *C. monachus* and *C. capucinus,* often called the capuchin. One of the most common species is the weeper (*Cebus apella*). They are small in size, playful in disposition, leading a gregarious life, and feeding chiefly on fruits and insects.

Sap Green, a pigment prepared by evaporating the juice of the berries of the *Rhamnus catharticus,* or buckthorn, to dryness, mixed with a little alum. It is soluble in water; acids redden it, but the alkalies and alkaline earths restore the green color. It is used by water color painters as a green pigment. Called also bladder green, being kept in bladders to dry and harden.

Saphir, Moritz (säf'ēr), an Austrian humorist; born in Lovas-Berény, Hungary, Feb. 8, 1795. Among his numerous writings are: "Album for Play and Earnest, Fun and Humor" (2 vols. 1846; 5th ed. 1875); "Dictionary of Wit and Humor" (2 ed., 5 vols. 1860). He died near Vienna, Austria, Sept. 5, 1858.

Sappan, or **Sapan,** a dye wood, produced by *Cæsalpinia sappan,* a native of Southern Asia and the neighboring islands. It resembles Brazil wood in color and properties.

Sapindaceæ, soapworts; the typical order of *Sapindales.* Trees, shrubs, twining and with tendrils, rarely climbing herbs; leaves alternate, generally compound, sometimes dotted; flowers small, in racemes or racemose panicles, white or pink, rarely yellow; calyx four- or five-parted, or of four or five sepals; petals four, five, or none; disk fleshy; stamens 8 to 10, rarely 5, 6, or 7, or 20; style undivided, or two- or three-cleft; ovary generally with three, rarely with two or four cells, and one, two, three, rarely more ovules; fruit capsular, two- or three-valved, sometimes winged, or fleshy and indehiscent; embryo, often curved or twisted spirally; found in South Ameri-

ca, in India, and various tropical countries; tribes, *Sapindeæ*, *Hippocastaneæ*, *Dodoneæ*, and *Meliosmeæ*. Known genera, 50; species, 380.

Sapindales, in botany, the Sapindal alliance; an alliance of hypogynous exogens, with monodichlamydeous, unsymmetrical flowers, axile placenta, an imbricated calyx and corolla, definite stamens, and little or no albumen. Orders: *Tremandraceæ*, *Polygalaceæ*, *Petiveriaceæ*, *Vochyaceæ*, *Staphyleaceæ*, *Sapindaceæ*, *Accraceæ*, *Malpighiaceæ*, and *Erythroxylaceæ*.

Sapindus, the soap tree; the typical genus of *Sapindaceæ*. Trees or shrubs, with equally pinnate leaves, and panicles of white or greenish flowers. The fleshy fruits of *S. esculentus* and *S. senegalensis* are eaten. The acrid fruits of *S. saponaria* and *S. inæqualis*, placed in water, form a lather used in lieu of soap in the West Indies. If pounded and thrown into water they intoxicate fish. A tincture of the berries has been recommended in chlorosis. *S. mukorossi* (or *detergens*) and *S. trifoliatus* (or *emarginata*), both cultivated in India, yield a gum. The seeds of the first and the fruit of the second are given in India medicinally. The fruit of *S. attenuatus* is eaten in Sylhet.

Sapodilla, or **Sappodilla,** the fruit of *Achras sapota*. It is highly esteemed in the West Indies. Its bark is astringent and febrifugal; its seed aperient and diuretic.

Saponaria, in botany, soapwort, or fuller's herb; a genus of *Silenæ* or *Caryophyllæ*. Calyx monophyllous, cylindrical, and one-toothed, without bracteas; petals five-clawed; stamens 10; styles two; capsule four-toothed; seeds globose or reniform Known species about 30. Europe and temperate Asia. The mucilaginous sap of *S. vaccaria* is used in India in washing clothes and as a cure for the itch.

Saponin, senegin; polygalin; a substance first observed in the common soapwort, but now found to be widely diffused through the vegetable kingdom. Quillaja bark, horse chestnuts, and senega root yield it in considerable quantities. The powdered substance is boiled in strong alcohol and filtered hot; the saponin separates in flocks on cooling and is purified by animal charcoal. It is a white friable powder, having a burning and persistently disagreeable taste, is more soluble in dilute than strong alcohol, and forms with water a frothy solution. It is often used to give an artificial froth to beer and effervescing beverages.

SAPOR I. TRIUMPHING OVER VALERIAN.

Saponite, an amorphous mineral occurring as nodules, or filling crevices, and forming amygdules in igneous rocks; soft, but brittle when dry; sp. gr., 2.266; luster, dull to greasy; color, various; composition: essentially a hydrated silicate of magnesia and alumina, but analyses vary considerably, the substances being more or less impure. Also a clay resembling soap, occurring in the granite of the hot springs of Plombières, France.

Sapor I., or **Shahpur,** a Persian king who reigned about A. D. 300. He belonged

to the dynasty of the Sassanidae, which ruled Persia for about 400 years. Sapor's most noteworthy achievement was his successful war with the Romans, in which he defeated, took captive, and put to death the Emperor Valerian.

Sapotaceæ, sapotads; an order of perigynous exogens, alliance Rhamnales; trees or shrubs, often milky; leaves alternate, sometimes, or nearly, whorled, entire, coriaceous, exstipulate; calyx regular, persistent, with five, rarely with four, to eight divisions; corolla monopetalous, regular, deciduous, its segments generally as numerous as those of the calyx; fertile stamens as many, alternating with the same number of sterile ones; style one; stigma undivided or lobed; ovary superior, several celled, each with one ovule; fruit fleshy, with several one-seeded cells, or by abortion with one; seeds nut-like. They are natives chiefly of tropical India, Africa, and America; known genera 21, species 212.

Sapper, in military language, a term applied in England to officers and men of the Royal Engineers, who were originally organized as a corps of "Sappers and Miners." They are at present divided into troops and companies. The former are mounted for telegraph and pontooning duties; the latter are designed for service in the field with the infantry columns, for which purpose they are provided with entrenching tools, etc.; for submarine mining on the coasts; for garrison duty, where they undertake the work of skilled mechanics, and for surveying in Great Britain and elsewhere. Others are permanently employed in telegraph maintenance work for postal service. They are armed and equipped similarly to the infantry. In the United States the work of the old sappers and miners is now done by the Engineer Corps.

Sapphire, a gem excelled in value by no precious stone except the diamond, and regarded as a variety of corundum, highly transparent and brilliant. It is sometimes colorless or nearly so. It more frequently exhibits exquisite color, generally a bright red (*i. e.*, the ruby) or a beautiful blue — the latter being that commonly called sapphire. Purplish or greenish color indicates a flaw; and usual defects are clouds, milky spots, flakes, or stripes. It is found crystallized, usually in six-sided prisms, terminated by six-sided pyramids; it is sometimes found imbedded in gneiss, but more frequently occurs in alluvial soils. It occurs in Bohemia and Saxony, but European sapphires are of no commercial importance. The finest are found in Ceylon; Kashmir and Burma also produce fine specimens; and sapphires are found in Victoria, New South Wales, and parts of the United States. The value depends on quality more than on size, and does not increase with the size as does that of the ruby. Smaller ones vary from $10 to $60; carat-sized ones from $60 to $150. One of 165 carats, shown at the Paris Exhibition of 1867, was sold for $40,000. In spite of its hardness it is sometimes engraved. It is doubtful if the sapphirus named in Scripture was our sapphire or the hyacinth. By a "male sapphire" (as in Browning) the ancients meant a dark-hued or indigo sapphire, by a "female sapphire" one pale blue, approaching to white.

Sapphirine, a mineral of a pale blue color; occurring in grains with mica, etc., at Fiskenaes, Greenland. Crystallization, orthorhombic; hardness, 7–8; sp. gr., 3.42-3.48; luster, vitreous; translucent; dichroic. Composition: Silica, 14.5; alumina, 66.2; magnesia, 19.3 = 100, which is equivalent to the formula, $3MgO + 4Al_2O_3 + 1\frac{1}{2}SiO_2$.

Sappho (saf'ō), a renowned Greek lyric poet; born in the island of Lesbos about 612 B. C. She wrote nine books of poems, but besides some small fragments of her poems we have in complete form only a "Hymn to Aphrodite" and an "Ode to a Beautiful Girl." In antiquity, as Homer was ever "The Poet" above all others; so Sappho was "The Poetess." She was also called "The Tenth Muse."

Sappho's Leap, Cape Ducato, on Santa Maura, one of the Ionian Isles. It was anciently called Leucadia, (from the Greek λευκος, "white"), because of its snowy cliffs, and is famed in classic story as the spot from which the poetess Sappho was said to have cast herself into the sea, an incident now considered purely legendary.

Saprolegnia, a genus of fungi which grow on dead and living animals and plants in water, and form the characteristic feature of the salmon disease.

Sap Roller, a large gabion filled with another gabion of less diameter as well as with fascines. It is used by sappers, who roll it before them in digging a sap to protect them from the fire of the enemy. See GABION.

Saprophytic Plants, plants that feed on decaying organic matter. In common with many of the PARASITIC PLANTS (*q. v.*), which are plants that live on or in and at the expense of other organisms, they are often devoid of chlorophyll. The reason of this peculiarity is obvious; chlorophyll being the material used by ordinary plants for the decomposition of the carbonic acid of the air in order that they may retain the carbon, and with it build up all the carbon compounds characteristic of organic nature, it is plain that those plants which obtain their carbon compounds ready-made up to a certain point do not require chlorophyll from which to manufacture them. If the saprophytism be not complete or "pure"

there will be at least some chlorophyll remaining, as in the flowering axis of the orchid *Neottia*. Saprophytes may obtain their nourishment and especially their carbon compounds either from the remains of dead organisms or from organic compounds formed by living organisms. The Fungi that live on the bark of trees and the leaf-soil of forests and meadows (*e. g.*, mushrooms) are examples of the former case; those that feed on the juice of fruits and sugary solutions (*e. g.*, molds and yeasts) of the latter case. Examples of saprophytes are found in the Phanerogams, the Fungi, and the Bacteria. Among the Phanerogams are some common native Orchids — *Neottia*, *Corallorhiza*, *Lattræa*, and *Monotropa*. After prolonged nourishment within the loose humus, such plants send up flowering shoots above the surface.

Fungi may be physiologically classified as parasites and saprophytes; but this classification does not coincide with a morphological one. Further, there are certain species which lie between the two extremes, and these may be described as parasites which may become wholly or in part saprophytic through the whole course of their development or during certain stages of it; and also there are saprophytes which, with the same variations, may become parasitic. Hence the complete physiological classification of the Fungi becomes (1) Pure saprophytes; (2) "Facultative" saprophytes — *i. e.*, parasites which become saphrophytic; (3) "Obligate" parasites — *i. e.*, species to which the parasitic life is indispensable; (4) "Facultative" parasites.

The external conditions necessary for the commencement of germination of Fungi are the same as those needful to the germs and seeds of other plants; they are a certain temperature, a supply of oxygen and of water, in certain cases a supply of nutrient substances. The spores of the Perenosporeæ and of the Uredineæ germinate on drops of pure water; nutrient solutions may even be a hindrance. The Mucorini, on the other hand, emit only rudimentary germ tubes in pure water; they require a nutrient solution for germination. Most Fungi vary toward one extreme or other according to the species.

A further characteristic of many Fungi is that certain species are only to be found on a specific substratum. For instance, the *Saccharomycetes*, which excite alcoholic fermentation, appear on fruits only when these are ripe, and in the winter are found in soil around those plants whose ripe fruit they attack, and very rarely in any other place. Further, the effect upon the substratum varies with the species to a greater or less extent. On the other hand, many diverse species live on the same substratum and effect the same results upon it — *e. g.*, many species of *Saccharomycetes* and certain species of *Muear* produce very similar fermentation in saccharine fluids (see FERMENTATION). A destructive effect is witnessed in the reduction of timber to a mass of dirt by *Merulius lacrymans*.

Bacteria may be classified physiologically in the same terms as the Fungi. And their functions vary in the same way. Many oxidize their substratum; the *Microcoecus* of vinegar oxidizes ethyl-alcohol into acetic acid, and by further combustion into carbonic acid and water. Others excite characteristic fermentations, lactic acid, butyric acid fermentations, etc., produced by specific organisms. Others incite putrefaction.

Sapsucker, the popular American name of several small woodpeckers.

Sapucaia Nuts, the seed of *Lecythis ollaria* and *L. zabucajo* trees, plentiful in the forests of the N. of Brazil, and belonging to the natural order *Lecythidaeeæ*. The fruit is urn-shaped, as large as a child's head, and opens by a lid which falls off. Each fruit contains a number of seeds or nuts, as in the case of the allied Brazil nut; but the flavor is finer than that of the Brazil nut. Its form is oval, somewhat pointed at both ends, which are slightly bent in opposite directions.

Saraband, Sarabanda, or **Sarabande,** a Spanish dance of Moorish origin, for a single performer, who accompanies himself with the castanets. The tune is in ¾ time, but slow and stately, and with a strong accent on the second beat in the bar.

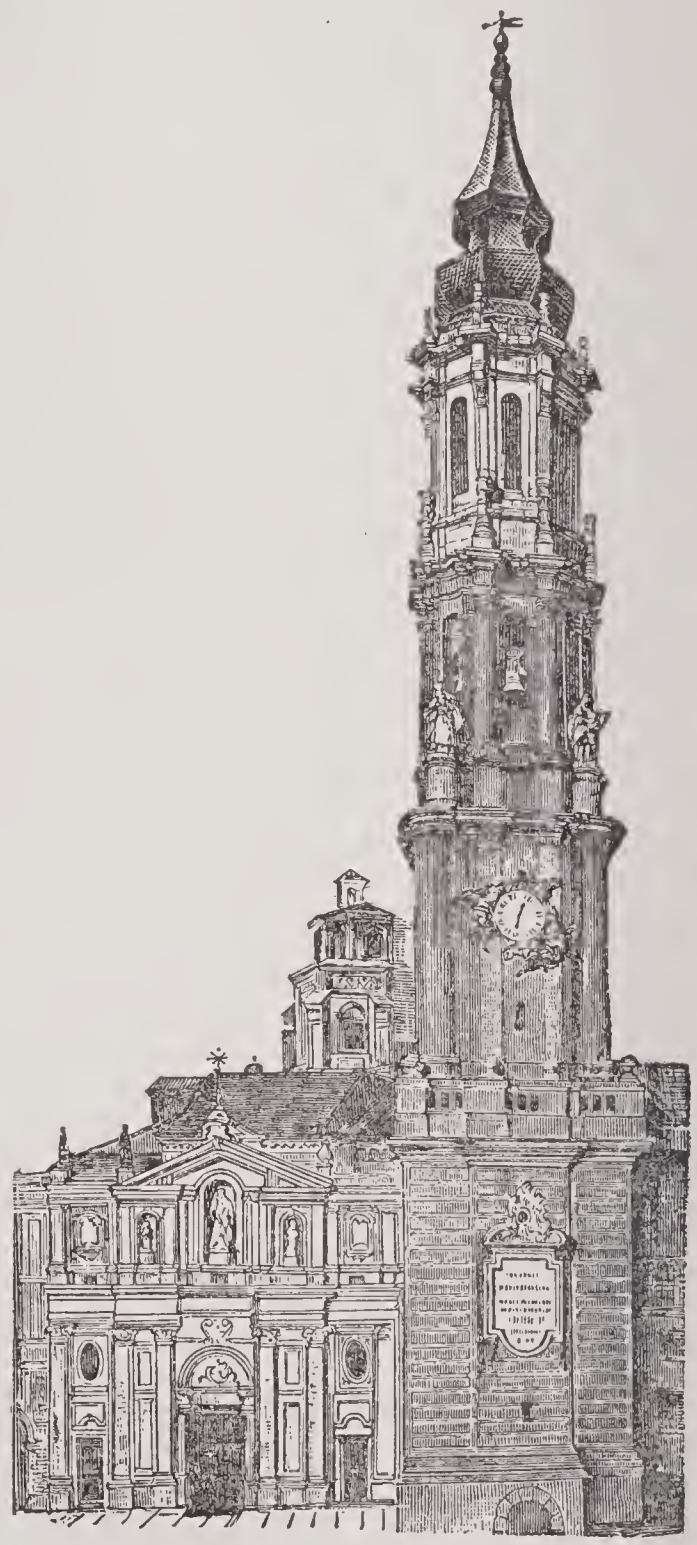
Sarabat. See PACTOLUS.

Saracen, an Arabian or other Mussulman of the early and proselytizing period; a propagator of Mohammedanism in countries lying to the W. of Arabia. By mediæval writers the term was variously employed to designate the Arabs generally, the Mohammedans of Syria and Palestine, or the Arab Berber races of Northern Africa. At a later time it was also applied to any infidel nation against which crusades were preached, such as the Turks.

Saracenic Architecture, the style adopted by the followers of Mahomet in building their mosques, palaces, and tombs. Originally the Arabs possessed no distinctive architectural style, and the style which they at length made their own was developed by architects belonging to the countries which they had conquered. This style is chiefly represented in Egypt, Persia, Spain, Turkey, and India, but the Saracenic architecture of Spain is generally called by the distinctive name of Moorish. The most prominent features of the style are the dome, the minaret, and the pointed arch. The Saracenic domes rise from a square base, sometimes in groups of three or more, are graceful in form, and frequently en-

riched externally with colored tiles or other decorations. The minarets are slender towers of considerable height, rising in stages or stories, each with a balcony, and are most frequently octagonal, sometimes cylindrical, rising, however, from a square base. The arch is of the pointed variety, this form having been used by the Arabs in Egypt before the rise of the Gothic in Europe. It is sometimes of the horseshoe form (see ARCH). The use of clustered pendentives (honeycomb work) to form a transition from the quadrangular area under a dome to the arch of the dome itself is very peculiar and common. Externally the tops of walls are often finished off with an upright cresting, which may be regarded as an ornament taking the place of a cornice. Flat surfaces are freely ornamented with a profusion of scroll work and conventional foliage, often in intricate and beautiful designs. Stucco is much used in ornamentation. The mosque el-Aksah at Jerusalem, reconstructed by Abd el Malek in A. D. 691, shows evidence of the Christian art of the time in its basilica of seven aisles. In Egypt the Saracenic art began with the mosque which Amru erected at Old Cairo in the 21st year of the Hegira (A. D. 642). Subsequently repaired and altered, it may now be considered as a good specimen of Moslem architectural art when freed from Christian influence. But the perfected Saracenic art dates from the building of a mosque at Cairo by Ibn Tooloon in A. D. 876. This building is nearly square (390 feet by 455) with a central court, around which on three sides are two ranges of arcades, while on the side toward Mecca there are five. It is built of brick covered with stucco. The mosque and tomb of Kaid Bey erected in 1463 outside Cairo is one of the most graceful specimens of Saracenic architecture. When the Turks captured Constantinople in 1453 they appropriated the Christian churches of the city, the most important of which was St. Sophia. Such was their appreciation of this Byzantine building that they adopted its architectural style with modifications in all the mosques which they subsequently built there. The finest among these was built by Suleiman in A. D. 1550, and occupies nearly a square, being 225 feet by 205. In Persia the Saracenic architecture is supposed to be a development of the old Babylonian or Assyrian. The ruined mosque of Tabreez, one of the finest of its kind, belongs to the Mogul dynasty, and was begun by Ghazan Khan in A. D. 1294. In form it resembles a Byzantine church, but it is chiefly remarkable for the decorative results obtained by mosaic of glazed bricks and tiles in brilliant colors. The most splendid of Saracenic buildings in Persia was built during the dynasty of the Sufis by Shah Abbas (1585–1629) in his capital of Ispahan. This was the *Maidan* or bazaar, a large rectangular area inclosed by an arcade two stories in height, and to which was attached the great mosque or Mesjid Shah and other buildings. This latter building is 223 feet by 130, the center compartment being surmounted by a double dome, whose external height is 165 feet. Taken in the mass the Maidan Shah, with its gates and mosques, superbly decorated, is one of the most effective specimens of Saracenic architecture. See ARCHITECTURE.

Saragossa, a very old city of Spain, the capital of the old kingdom of Aragon, on the Ebro (which separates the city from its suburbs), 176 miles N. E. from Madrid. Without being regularly fortified, it is surrounded by an earthen wall and is built throughout of bricks. The houses are seldom above three stories in height; the



SARAGOSSA: OLD CATHEDRAL.

streets narrow and crooked, except one long and wide one called the Cozo. There are two bridges over the Ebro. The public buildings are numerous — churches, convents, and two cathedrals celebrated throughout Spain. The older one is much resorted to by pilgrims, as it contains a pillar on which the Virgin is said to have descended, and her image believed to have fallen from heaven. The city has a university, founded in 1478; also an academy of fine arts, with schools for drawing and other branches of education. It is noted in history for the memorable siege it sustained against the French, under Marshals Mortier and Lannes, and which lasted with slight intermission from July 15, 1808, to Feb. 21, 1809, when it finally surrendered, 54,000 of the inhabitants having died in the meantime, chiefly of plague. Pop. (1900) 99,118.

Saragossa, Maid of, a name given to Agustina, a Spanish heroine, who distinguished herself during the siege of Saragossa (1808–1809) by her services in battle. She was made a sub-lieutenant. She died in Ceuta, Spain, in June, 1857.

Sarah, the wife of ABRAHAM (*q. v.*).

Sarah Tytler. See KEDDIE, HENRIETTA.

Saratoff, or **Saratov,** a city of Russia, on the Volga; 500 miles S. E. of Moscow. It is built chiefly of wood, and stands on terraces rising from the river. There are nearly 30 churches; a handsome new cathedral (1825), an old cathedral (1697), and Radistcheff's Museum, sheltering a fine art gallery and a library. Manufactures of brandy, liquors, flour, oil, and tobacco are carried on. Fishing is prosecuted in the river, and market gardening (especially fruit and the sunflower) in the vicinity. There is an important trade in corn, salt, iron, wooden wares, textiles, and groceries. The city was pillaged by Pugatcheff in 1774 and suffered severely from fire several times during the 19th century. Pop. (1897) 137,109.

Saratoga, The, a wooden sailing ship of the United States navy; displacement, 1,025 tons. Sailing ships of this class are fast disappearing from the navies of the world, but for training the young apprentice into an able-bodied man-o'-war's man there is no better school. When not in actual service the "Saratoga" is used by the Public Marine School of Philadelphia.

Saratoga, Battles of, in the Revolutionary War, two battles fought 12 miles E. of Saratoga Springs, N. Y. Burgoyne led the British in the first, while the Americans were under command of Gates, who had Morgan and Arnold as subordinates. The fight on Sept. 19, 1777, was indecisive. On Oct. 7, 1777, the Americans achieved a splendid victory over the British, the commanders of both armies being the same as in the first engagement. The result was the surrender of Burgoyne and his army, numbering 5,752 men, to the Americans, Oct. 17, 1777. These contests are sometimes called in history the battles of Stillwater and Bemis' Heights. The American victory came at a critical period of the Revolution. It frustrated the British plan for cutting off New England from the other states, enlisted the help of France, altered the policy of Parliament and the King and saved the cause of the patriots. Creasy enumerates it in his "Fifteen Decisive Battles of the World."

SARCOPHAGUS OF SCIPIO.

Saratoga Lake, a lake in Saratoga co., N. Y., 4 miles E. of Saratoga Springs. It is about 5 miles long and 2 miles wide.

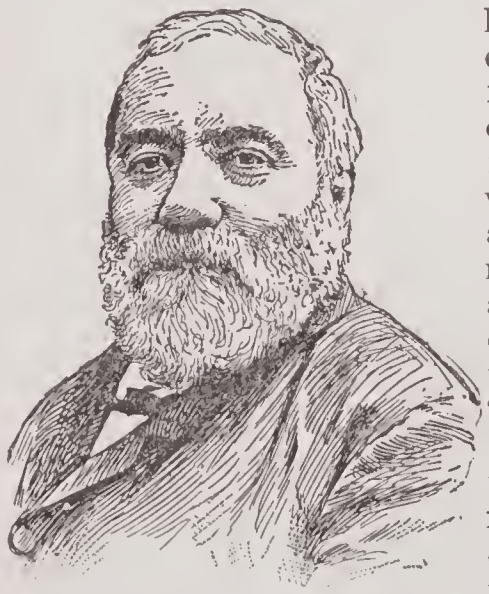
Saratoga Springs, a village in Saratoga co., N. Y.; on the Saratoga and Mount McGregor, the Adirondack, the Fitchburg, and the Delaware and Hudson railroads;

38 miles N. of Albany. Besides being one of the most fashionable summer resorts in the world, Saratoga is visited by many persons for its medicinal advantages. Here are about 30 mineral springs, some of which are of great celebrity. In 1909 measures were taken to convert the entire mineral tract into a State reservation. The village contains about 30 hotels, some of great elegance and capable of accommodating more than 1,000 guests each. During every summer Saratoga Springs is visited by many of the wealthiest persons in the United States. Here are a Young Men's Institute, a Young Ladies' Seminary, a State Armory, the Home of the Good Shepherd, a children's home, several libraries, Emergency Hospital, National banks, and daily, weekly, and monthly periodicals. The assessed property valuation is nearly $6,500,000. Pop. (1890) 11,975; (1900) 12,409; (1910) 12,693.

Saratov. See SARATOFF.

Sarawak, a State of Borneo, extending from Cape Datoo on the W. to the Samarahan river on the E. Area about 50,000 square miles. Coast line about 400 miles. The aboriginal inhabitants, called Dyaks, consist of various wild tribes who in 1844 took for their sovereign an Englishman, SIR JAMES BROOKE (*q. v.*), through whom the country is chiefly known. Pop. 500,000. Capital, Kuching.

Sarcey, Francisque (sar-sā'), a French author; born in Dourdan, France, Oct. 8, 1828. As dramatic critic for Paris journals he was highly esteemed for his independence of judgment and his wide acquaintance with dramatic literature and the history of the stage. He published: "History of the Siege of Paris," which in its first year reached the 30th edition; "The Word and the Thing," philosophical conversations (1862); "Étienne Moret," a semi-autobiographical story (1875); "Recollections of Youth" (1884); "Recollections of Mature Age" (1892); "The Theater" (1893), etc. He died in Paris, May 15, 1899.



FRANCISQUE SARCEY.

Sarcina, a plant of doubtful affinity, probably a fungus, consisting of minute quadrilateral bodies in fours, or some multiple of four. *S. ventriculi* was first observed by Goodsir in human vomit.

Sarcine, a substance existing in the juice of flesh. It is extracted from the mother liquor from which creatine has been separated, by adding nitrate of silver and decomposing the precipitate with sulphydric acid. It separates from an aqueous solution as a white crystalline powder, which dissolves in 300 parts of cold and 78 parts of boiling water. A weak organic base, uniting with acids and metallic oxides to form compounds, several of which are crystalline. The hydrochlorate $C_5H_4N_4O.HCl$ forms colorless tabular, and the sulphate needle-shaped crystals.

Sarcocarp, a botanical term meaning the fleshy part of a fruit between the epicarp and the endocarp.

Sarcocolla, a gum resin collected in Africa and the Levant, probably from *Penæa sarcocolla*. It is obtained in yellow irregular grains, has a sharp, sweetish-bitter taste, and is inodorous. It is chiefly a mixture of resin, gum, and sarcocollin, which may be separated from each other by the action of ether and then alcohol.

Sarcode, the name given to the unorganized or structureless gelatinous matter forming the substance of the bodies of animals belonging to the division Protozoa. It is nearly equivalent to protoplasm, so that it is sometimes called "animal protoplasm" or "BIOPLASM" (*q. v.*). See also PROTOPLASM.

Sarcolite, a tetragonal mineral, belonging to the Scapolite group, occurring sparsely in pale flesh-red crystals in the volcanic agglomerates of Monte Somma, Vesuvius. Hardness, 6; sp. gr., 2.545; luster, vitreous; transparent to subtransparent. Composition: Silica, 39.7; alumina, 22.8; lime, 33.4; soda, 4.1 = 100, represented by the formula $(\frac{1}{2}\ (CaO + \frac{9}{10}\ NaO^3 + \frac{1}{2}\ Al_2O_3)^2,\ 3SiO_2$.

Sarcoma, plural **Sarcomata,** cancerous growths, consisting of connective tissue cells retaining their embryonic condition. Those that remain in this elementary condition are round cells; those which advance one stage further are spindle-shaped; and a third kind originating in the bone, and having large nucleated myeloid cells, are called myeloid. The first is the most malignant.

Sarcophagus, plural **Sarcophagi,** a kind of stone used among the Greeks for making coffins, and so called because it was believed to have the property of consuming the flesh of dead bodies deposited in it within a few weeks. It was also called "Assos stone," from being found at Assos, a city of Lycia, in Asia Minor.

"Near unto Assos, a citie in Troas, there is found in the quarries a certain stone called sar-

cophagus, which runneth in a direct veine, and is apt to be cloven and so cut out of the rocke by flakes. The reason of that name is this, because that within the space of fortie daies it is known for certaine to consume the bodies of the dead which are bestowed therein, skin, flesh, and bone, all save the teeth."—P. Holland, "Pliny," bk. xxxvi., ch. xvii.

Hence a coffin or tomb of stone; a kind of stone chest used for containing a dead body. Sarcophagi were anciently in general use, at least with the wealthy, among the Orientals, particularly those inhabiting the E. shores of the Mediterranean, and were often ornamented with elaborate and expensive sculptures. In modern times stone coffins are occasionally used for royal or distinguished persons.

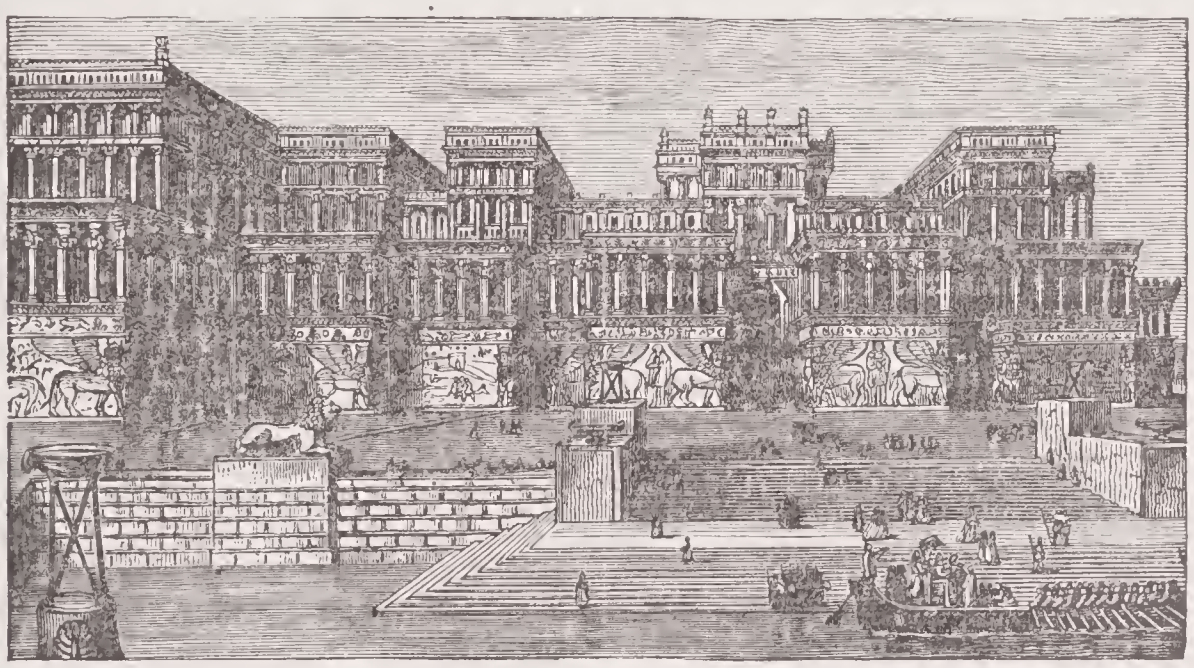
Sarcopside, a mineral occurring in irregular ellipsoids in a granite vein between Michelsdorf and the Mühlbachthal, Silesia. Crystallization, probably monoclinic. Hardness, 4.0; sp. gr., 3.692–3.730; luster, somewhat silky; color when fresh, flesh-red to lavender-blue; streak, straw-yellow. Composition: A phosphate of the proto- and sesquioxides of iron and manganese. Dana suggests that it may be a variety of triplite.

Sarcorhamphus, the condor, the typical genus of the sub-family *Sarcorhamphinæ*, with two species, from the Andes of South America, and below lat. 41° S.; beak large and strong, with fleshy caruncles at base.

Sarcosine, methylglycocine. $C_3H_7NO_2 = C_2H_4(CH_3)NO_2$, a substance metameric with analine and urethane, obtained by the action of baryta on creatine. It forms colorless trimetric crystals, very soluble in water, slightly in alcohol, is neutral, and has a sweetish and rather metallic taste. It is a weak base, and combines with acids to form crystalline compounds.

Sard, a precious stone that is a very compact variety of chalcedony presenting on a fractured surface a dull horn-like aspect; color, pale yellowish-red, shades of brown, transparent to translucent. It was much esteemed by the ancient gem engravers.

Sardanapalus, the name of several Princes of Assyria, the most celebrated of whom was the last sovereign of the first Assyrian empire. His reign dates from 836 to 817 B. C., when he was dethroned by Arbaces and Belesis, at the head of a revolt of the Medes, Persians, and Babylonians. In the last extremity, Sardanapalus, who had withstood a siege for three years in Nineveh, placed himself, his treasures, his wives, and his eunuchs on a funeral pile, which he fired with his own hand. He had ceased to exist when the city was taken, and that event was followed by the dismemberment of the Assyrian empire. The above date is only an approximation to the true one, as authorities vary.



THE PALACE OF SARDANAPALUS, RESTORED.

Sardica, anciently a town in Lower Dacia, on the site of the modern Turkish town of Sofia or Sophia. The town is chiefly celebrated as the place where an ecclesiastical council was held in 347, at which Athanasius defended himself against the Arians. See ATHANASIUS, ST.

Sardine, a name applied to several kinds of small fish of the family *Clupeidæ*, the true Mediterranean sardine. The fishing season begins early in June, and is now successful in places along the Atlantic coast and on Puget Sound. The coasts of Norway and Brittany, in France, are the scenes of the heaviest takes, and the grade of sardines obtained there is superior. As soon as the fishermen notice shoals of the porpoise or flocks of seagulls off shore sail is made immediately, for the sardine is there. Of the 250 or 300 fishing boats fitted out at Belle Isle about 200 belong to Calais and the others to Lauzon. It is in

these two ports that the French fishermen sell their fish. An ordinary catch of sardines gives to each boat from 8,000 to 10,000 fish and the price is regulated by the quantity brought in by the first comers.

During the sardine season about 300 women and 50 men await the arrival of the first boats. If there are no fish there is no work for them. When the news arrives that the boats have their welcome cargoes the women, in their picturesque costumes, rush to the cannery like a flock of frightened sheep, and each takes her place in the great room where the fish undergo their first preparation. Here the sardines are spread on the table and sprinkled with salt. Then they are cleaned, and when that operation is finished they are sorted by boys and carried into another part of the establishment, where they are put in pickle. After this the fish are washed and placed, one by one, with great care, on wire nets, called "grills," and put out to dry in the open air. If the weather is wet or even foggy this operation is impossible, except for fertilizing. The tins in which the sardines are then packed are carried to the oiling room, where the last manipulation consists of filling them with oil. It is in this part of the establishment that the tomato sauce and the spices are placed in the boxes, which give to the French preparation their universal renown. In any one of the above important establishments the sardines are prepared and exported 10 hours after coming out of the water. In the United States an extensive industry is carried on, especially on the New England coast, in the way of preserving small fish such as small herring, which are sold under the name of sardines.

Sardinia, an island of Italy, after Sicily the largest in the Mediterranean; 135 miles W. of the mouth of the Tiber, and immediately S. of Corsica, being separated from it by the Strait of Bonifacio, 7½ miles wide. In shape it resembles an oblong set on end, with a deep wide bay, the Gulf of Cagliari, in the S., and another, the Gulf of Porto Torres, in the N. From N. to S. it measures 170 miles, and from E. to W., on the average, 75 miles; area, 9,206 square miles. Off various points along the shores lie islands, the largest being San Antioco, San Pietro, Dell' Asinara, Maddalena, Caprera, Tavolara, etc. The surface is generally mountainous, the configuration that of a table-land running up into ranges and isolated peaks. The highest points occur along the E. side of the island, and reach 6,233 feet in Gennargentu in the center, and 4,287 in the mountains of Limbara in the N. The W. side of the island ranges at about 1,240 feet, though the extinct volcano of Monte Ferru reaches 3,400. The S. W. corner is separated from the main mass of the island by the low alluvial plain of Campidano, which stretches from the Gulf of Cagliari to the Gulf of Oristano, on the W. coast; at both extremities of it there are extensive salt lagoons. The only other low-lying tracts are the lower portions of the river valleys. The streams, however, are mostly short, the longest not exceeding 65 miles. The N. E. shores are high and rocky. On the W. the coast-line is more irregular than on the E.; the grotto of Neptune, on this W. coast, is one of the finest in Europe. Ever since the time of the Roman possession the climate of the island has been in evil repute. This is because of the malaria that prevails in the low-lying tracts, where there is often much stagnant water after the rains, and much decaying vegetable matter in the hot season. The parts that lie at a higher level are quite as healthy as the corresponding districts of Italy.

Sardinia is in nearly all respects a backward island. It has fine natural resources — fertile soil, valuable mines, extensive forests, rich fisheries, and excellent facilities for manufacturing industry. But owing to the old-fashioned conservatism of the people, their apathy, their primitive methods of agriculture, lack of enterprise and capital, and want of means of communication, and long years of negligent, if not inefficient government, its resources are by no means developed to the extent they could be; many lucrative industries are in the hands of foreigners, others are neglected by the Sardes, and those that they do carry on are often carried on in a half-hearted manner and with obsolete methods. Feudalism was not finally abolished in the island till 1856. Of the total area about one-third is arable land, one-third pasture, and nearly one-third (28 per cent.) forest. The first place among the natural resources is taken by the agricultural products, in spite of the backward farming, the heavy taxation, and the extremely minute subdivision of the soil. The principal produce is wheat, barley, beans, potatoes, wine (21,500,000 gallons per annum), olive oil (1,500,000 gallons), oranges, lemons, tobacco, flax and hemp, cheese, butter, and wool. The breeding of horses is an important industry; and large numbers of cattle, sheep, swine, and goats are kept. The growing of fruits and the breeding of the domestic animals are both carefully attended to, and the products of both industries are improving; but the only improvement in the management of the soil is the drainage of the marshes by the government and private individuals.

Besides being in ancient times the granary of Rome, Sardinia was renowned for its mineral wealth. After lying unused from the fall of the Roman empire the

mines were again worked by the Pisans in the 14th and 15th centuries; but work was not resumed in them with any degree of energy till toward the middle of the 19th century. Iron, copper, lead, zinc, antimony, manganese, and lignite exist. Granite, marble, and clay for pottery are quarried. Salt is manufactured from sea water, chiefly by convicts at Cagliari. The mines are mostly situated in the S. W. in the neighborhood of Iglesias. The center and N. of the island are chiefly covered with forests, though they are being all too rapidly diminished. The commonest as well as the most valuable trees are the oak, ilex, cork, and wild olive, which yield timber, cork, bark for tanning, acorns, and charcoal to the annual value of close on $1,500,000.

The seas yield large quantities of tunny, sardines, anchovy, and coral, though the fisheries, except for tunny, are not prosecuted by Sardinians, but by Italians; the native fishermen prefer to catch trout, eels, lobsters, crabs, etc., in the rivers and inland lagoons. Sardinia has no extensive manufacturing industries, though there is some tanning and making of cigars, aerated waters, macaroni, flour, and spirits. There are, however, a variety of domestic industries for home use; most of the women still ply the spinning wheel. Till the year 1828 Sardinia had no roads for wheeled vehicles, the Roman roads having gone to ruin centuries ago. Now there are good roads throughout the island; and they are supplemented by 350 miles of railway. In spite of their maritime situation the Sardinians are not fond of the sea.

The island has numerous fairly good ports — Cagliari (the capital), Porto Torres, Terranova, Tortoli, Alghero, Carloforte, and Bosa — most of which are being improved by the construction of harbor works. About 6,000 vessels of 1,250,000 tons enter every year. The inhabitants are for the most part of mixed race, Spanish and Italian elements predominating. Pop. (Jan. 1, 1906) 824,397. Education is in a very backward state, 83 per cent. of the population being unable to read and write. There are universities at Cagliari and Sassari. The practice of the vendetta and brigandage were extremely prevalent among this people; but both have now almost entirely ceased. The language is a mixture of Latin, Spanish, and Italian; but the dialects of different parts differ considerably. Classical Italian is the official language, and is used by the educated classes. The mouflon or wild sheep, with red deer, fallow deer, wild boar, and an abundance of smaller game, such as hares, partridges, woodcock, snipe, etc., are the creatures chiefly hunted. Administratively the island is divided into the two provinces of Cagliari and Sassari. There are three archbishoprics, Cagliari, Sassari, and Oristano, and eight bishoprics.

History.— The aboriginal inhabitants are believed to have been of Iberian stock, though this is by no means certain. They seem to have been conquered by the Phœnicians at an early period; but little authentic is known before the conquest by the Carthaginians in 512 B. C. For two centuries and a half this people bitterly oppressed the native inhabitants, so that when the Romans came in the 3d century they were hailed as deliverers. But the Sardinians did not at first bear the Roman yoke very patiently, though afterward, from the reign of Tiberius onward, they enjoyed 300 years of continuous peace and prospered greatly. After the fall of the Roman empire evil days again fell on the island; it was overrun by Vandals and Goths, and then for many years was incessantly harassed by the Saracens. During this time its nominal masters were the Byzantine emperors (till 774) and the Popes. In the beginning of the 11th century the Pisans and Genoese undertook the task of driving out the Saracens and holding the island against them; but they had a hard task for 20 years or more. Then, the Moslems beaten off, they took to quarreling with one another, and only agreed to divide the island between them in 1299, Genoa taking the N., Pisa the S. But the real internal government was in the hands of four "judges" or chiefs, each ruling a separate province; this arrangement existed several centuries before the Pisans came, and continued to exist for several centuries longer. The Pope, who still claimed the over-lordship, at this time gave Sardinia to the King of Aragon; and he made himself definitively master of it in 1416. The Aragonese and their sovereign successors, the Spaniards, kept possession of it till the treaty of Utrecht (1713); it then passed to Austria, but in 1720 was given to the House of Savoy in exchange for Sicily. United with Savoy and Piedmont, it gave title to a new kingdom, the kingdom of Sardinia. See SAVOY.

Sardis, the capital of ancient Lydia in Asia Minor; stood at the N. foot of Mount Tmolus (5,906 feet), 2½ miles S. of Hermus. Through its market place flowed the Pactolus over sands rich in gold, an allusion in all probability to the wealth of the inhabitants, who wove woolen stuffs and carpets, and organized the traffic between the highlands of the interior and the coast; it was, moreover, the grand and luxurious capital of Crœsus, a monarch of fabulous wealth. In spite of the strength of its citadel it was destroyed by the Cimmerian Gauls in the 7th century B. C., by the Athenians in the 6th, by Antiochus the Great in 215 B. C., and by Timur in 1402; besides this it was overwhelmed by earthquake in

the reign of Tiberius. Both Xerxes and Cyrus the Great resided here before setting out on their great expeditions. As Byzantium rose to importance, Sardis lost the advantages of its situation on the great land route between Persia and Rome, and gradually declined. At the present day there is nothing left at its site, Sart, except a small village and ruin mounds. The cemetery of the ancient city, 4 miles distant across the Hermus, is of great extent, and has been in part opened up in recent times.

Sardou, Victorien (sär-dö′), a French dramatist; born in Paris, Sept. 7, 1831. He began play-writing in early life, though intended originally for the medical profession. Among his plays are: "The Students' Inn" (1854); "Monsieur Garat" (1857?); "Saint Gervais" (1860); "Blockheads" (1861); "Piccolino" (1861?); "Our Intimates"; "The Butterfly" (1862); "The Black Devils" (1863); 'Don Quixote" (1864); "The Benoîton Family" (1865); "The New House" (1866); "Seraphine" (1868); "Fernande" (1870); "Rabagas" (1872); "Uncle Sam" (1873); "Ferréol" (1875); "Dora" (1877); "Daniel Rochat" (1880); "Divorçons" (1881); "Odette" (1882); "Fédora" (1883); "Théodora" (1884); "Crocodile" (1886); "La Tosca" (1887); "Mama-in-law" (1889); "Cleopatra" (1890); "Thermidor" (1891); "Gismonda" (1894); "Madame Sans-Gêne"; and "Pamela" (1898); etc. He was elected to the Academy in 1877; died Nov. 8, 1908.

Sardonyx, onyx consisting of alternate layers of sand and nearly opaque-white chalcedony. It is the most beautiful and the rarest variety of onyx, and that which was held in the greatest esteem by the ancients for engraving into cameos.

Sargasso Sea, a name applied to large areas of the ocean covered with floating seaweed, *Sargassum bacciferum*. The best known Sargasso Sea lies in the North Atlantic Ocean, between the Azores and Antilles, its position being determined by the central whirl of the Gulf stream. It was noticed by Columbus, who recorded on his first voyage of discovery (1492) that his whole course was through masses of these weeds, from Sept. 16 to Oct. 12. There is a smaller Sargasso Sea off the coast of Lower California, in the Pacific Ocean. Another lies between Australia and the Falkland Islands in the Antarctic waters. Many kinds of animal life are found in the floating weed, crustaceans, mollusks, and fish, with minuter forms. As the breeding places of certain sea fish are unknown, it has been conjectured that the Sargasso Seas serve this purpose.

Sargassum, a genus of *Algæ*. *S. bacciferum* is the gulf-weed of the Atlantic. Its stems are much employed in South America, under the name of goitre-sticks, in the treatment of goitre. Their beneficial effects are due to the large proportion of iodine existing in the plant.

Sargent, Aaron A., an American diplomatist; born in Newburyport, Mass., Sept. 28, 1827; early learned the printer's trade, and in 1847 became a newspaper reporter in Washington, D. C. In 1849 he removed to California, where he engaged in mining and later established the "Nevada Journal." While editing this paper he studied law and was admitted to the bar. He became district attorney of Nevada in 1856; was vice-president of the Republican National Convention in 1860; served several terms in Congress; was for six years a member of the United States Senate; and in 1882 was appointed United States minister to Germany by President Garfield. He died in San Francisco, Cal., Aug. 14, 1887.

Sargent, Charles Sprague, an American arboriculturist; born in Boston, Mass., April 24, 1841. He was director of the Botanic Garden and Arboretum (1872–1878), and Professor of Arboriculture at Harvard after 1878. He wrote many authoritative reports and books; among them are: "Report of the Forests of North America"; "The Woods of the United States" "Notes on the Forest Flora of Japan"; "The Silva of North America"; etc.

Sargent, Epes, an American author; born in Gloucester, Mass., Sept. 27, 1813. His works include: "Change Makes Change," a comedy; "The Priestess," a tragedy; "Wealth and Worth" (1840), a novel; "Peculiar: A Tale of the Great Transition" (1863); "Life of Henry Clay." "Songs of the Sea" and "A Life on the Ocean Wave" are the most popular of his verses. His "Cyclopædia of English and American Poetry" was published in 1883. He died in Boston, Dec. 31, 1880.

Sargent, Herbert Howland, an American military officer; born in Carlinville, Ill., Sept. 29, 1858; was graduated at the United States Military Academy in 1883 and assigned to frontier duty. At the breaking out of the American-Spanish War in 1898, he was first engaged in organizing volunteer troops, but was early sent to Santiago, Cuba; thence to Guantanamo in 1899; and back again to the United States in May of that year. In July, 1899, he was ordered to Luzon, where he participated in several engagements with the insurgents, and commanded the attacking forces at the battle of San Mateo. In June, 1900, he was appointed judge advocate of the department of Southern Luzon.

Sargent, James, an American inventor; born in Chester, Vt., Dec. 5, 1824; became a partner in the Yale & Greenleaf Lock Co., in 1857; patented and began the manufac-

ture of a burglar-proof lock in Rochester, N. Y., in 1865, and subsequently invented and placed on the market many varieties of locks. He invented the glass enameled steel tanks and vacuum pumps used by the Pfaudler Vacuum Fermentation Co.; the automatic semaphore railroad signals, and in 1873 patented the time locks which bear his name.

Sargent, John Osborne, an American lawyer; born in Gloucester, Mass., Sept. 20, 1811; was graduated at Harvard University in 1830; studied law in Boston and was admitted to the bar in 1833; settled in New York city in 1838, and became associate editor of the "Courier and Enquirer," but soon after resigned and resumed the practice of law. In 1848 he conducted the "Battery," a campaign paper issued in Washington to support Gen. Zachary Taylor for President. Later with Alexander C. Bullitt he founded the "Republic," in which he opposed both the Secession and Abolition parties. In 1861–1873 he lived abroad, but during the latter year returned to New York city. His publications include "Lectures on the Late Improvements in Steam Navigation and Arts of Naval Warfare" (1844); a version of "Anastasius"; Grün's "Last Knight" (1872); articles on "The Rule in Minot's Case"; etc. He died in 1891.

Sargent, John Singer, an American artist; born in Florence, Italy, in 1856; studied art under Carolus Duran; received a second-class medal at the Paris Salon in 1881; took a medal of honor at the Paris Exposition in 1889; and was elected an academician of the Royal Academy, England, in 1891, and of the National Academy of Design in New York in 1897. His works include the figure pieces: "Fishing for Oysters at Cancale"; "Neapolitan Children Bathing," and "El Jaleso"; the portraits: "Doctor Pozzi"; "Portrait of a Young Lady"; "Madam G."; "Mrs. Marquand"; "President Roosevelt" (1903); and numerous sketches, ideal figures, etc.

Sargent, Nathan ("Oliver Oldschool"), an American journalist; born in Poultney, Vt., May 5, 1794. He held many public positions, was connected with and established several newspapers, and under his pen name wrote a series of famous letters from Washington to the "United States Gazette." He published a "Life of Henry Clay" (1844), and "Public Men and Events" (2 vols. 1875). He died in Washington, D. C., Feb. 2, 1875.

Sargent, Winthrop, an American author; born in Philadelphia, Pa., Sept. 23, 1825; was graduated at the Harvard law school in 1847; practised law in Philadelphia and in New York city and wrote for the press. He wrote: "History of an Expedition against Fort Duquesne in 1755, under General Braddock" (1855); "The Loyalist Poetry of the Revolution" (1857); and the "Life and Career of Major John André" (1861). He died in Paris, May 18, 1870.

Sargina, in ichthyology, a group of *Sparidæ*, having jaws with a single series of incisors in front, and several series of rounded molars on the side. There is but one genus, *Sargus*, with 20 species. They feed on hard-shelled animals, which they crush with their molar teeth. Found in the chalk of Mount Lebanon.

Sark, or **Sercq,** one of the Channel Islands, situated about 6 miles from Guernsey. It is divided into Great Sark and Little Sark, the connection between these being a narrow neck of land called the Coupée; length about 5, and breadth abont 3 miles. The island is surrounded by almost inaccessible rocks, and the carriage roads are steep. Fishing is the chief employment; and the manufactures are principally stockings, gloves, etc.

Sarmatia, a name given by the Romans to all the country in Europe and Asia between the Vistula and the Caspian Sea. The people inhabiting this country were usually called Sauromatæ by the Greeks, and Sarmatæ by the Romans. The Sarmatians began to threaten the Roman empire in the reign of Nero (54–68). Since that time they figure promiscuously among the barbarians who vexed the N. E. frontier of the Roman empire. They were finally subdued by the Goths, with whom, in process of time, they were amalgamated.

Sarmatians, a people of supposed Asiatic race, who in time of the Romans occupied the vast region between the Black, Baltic, and Caspian Seas. They were a nomadic race, whose women went to war like the men, and they were said by tradition to be descended from the Amazons by Scythian fathers. Sarmatia coincided in part with Scythia, but whether the people were of the same race is doubtful.

Sarmiento, Domingo Faustino (sarmyĕn′tō), a South American writer; born in San Juan, Argentine Republic, Feb. 15, 1811. He was Minister of Public Instruction in 1860, Minister of the Interior in 1861, and while minister to the United States was elected president of the republic (1868). During 1845–1847 he visited Europe and the United States to study the system of primary schools. During his travels he made the acquaintance of Cobden, Guizot, Humboldt, and Horace Mann; under the influence of the latter he wrote "Popular Education," published (1848) by the Chilean government. Other important works of his are: "Life of Lincoln" (1866), and "The Schools the Foundation of Well Being in the United States" (1868). He died in Asuncion, Paraguay, Sept. 11, 1888.

Sarong, a plain or printed cotton fabric imported into the Indian or Eastern Archipelago; also a garment worn in the Indian Archipelago. It consists of a piece of cloth wrapped round the lower part of the body, that worn by women being deeper than that worn by men.

Saronic Gulf (*Sinus Saronicus*), the ancient name of the Gulf of Ægina, on the E. coast of Greece.

Saros, an ancient Assyrian astronomical period, the origin and exact length of which are unknown, though they have been the subject of much disputation. By some authors the saros has been confounded with the Metonic cycle.

Sarothamnus, a genus of plants; *Cytiscæ*, founded to receive the common broom, *S. scoparius*, formerly *Cytisus scoparius*. Sir J. Hooker reverts to the old name.

Sarpedon, in Greek mythology, a son of Zeus and Laodamia, King of the Lycians and ally of the Trojans. He was slain by Patroclus.

Sarpedon, *Papilio Sarpédon*, a beautiful species of butterflies found in Asia, Australia, and the Sandwich Islands.

Sarpi, Pietro (surnamed Servita), better known by his monastic appellation, Fra Paolo; an Italian historian; born in Venice Aug. 14, 1552, embraced the monastic life, and took the vows in the religious order of the Servites in 1565. Five years later the Duke of Mantua made him his court theologian; but he was soon after summoned to be Professor of Philosophy in the Servite monastery at Venice, and there he remained all the rest of his life. For nine years, however (1579–1588), he was absent in Rome looking after affairs connected with the reform of the Servite order. In early life his thoughts were principally given to the study of Oriental languages, mathematics, astronomy, and other branches of natural philosophy, including the medical and physiological sciences, in which he attained to great proficiency, being by some writers regarded (though without sufficient grounds) as entitled to at least a share in the discovery of the circulation of the blood. He kept up a correspondence with Galileo, Harvey, Bacon, and William Gilbert. In the dispute between the republic of Venice and Paul V. on the subject of clerical immunities Sarpi stepped forward as the valiant champion of the republic and of freedom of thought. On the repeal (1607) of the edict of excommunication launched against Venice, Sarpi was summoned to Rome to account for his conduct. He refused to obey, and was excommunicated as contumacious; and an attempt was made on his life by a band of assassins. He afterward confined himself within his monastery, where he wrote "History of the Council of Trent," a "History of the Interdict," and other works. The first named was published in London in 1619 under the pseudonym of Pietro Soave Polano, an anagram of Paolo Sarpi Veneto; and it almost

FRA PAOLO SARPI.

immediately rose into popularity with the adversaries of Rome, as well in England as throughout the continent. Ranke ranks Sarpi, in spite of the partisan spirit of his writing, as the second of Italian historians, next after Machiavelli. He died Jan. 15, 1623.

Sarplar, a large sack or bale of wool containing 80 tods; a tod contains 2 stone of 14 pounds each.

Sarraceniaceæ, in botany, the sarraceniads; an order of hypogynous exogens, alliance Ranales; herbaceous, perennial bog plants; roots fibrous; leaves radical, with a hollow, urnlike petiole; the lamina articulated at its apex, constituting a lid; inflorescence a scape with one or more flowers; sepals four, five, or six; petals none or five, unguiculate and concave; stamens numerous; styles simple, truncate, or crowned by a peltate plate with five stigmatic angles; capsule with two to five cells; seeds very numerous, minute, attached to placentæ, projecting from the axis; known genera two, species seven; mostly North American; one is from Guiana.

Sarrusophone, a form of wind instrument of the horn class. They are made *en suite*, of sizes and compass to take different parts in concerted pieces of music, and are known as the cornets and saxhorns by names, as soprano, contralto, tenor, baritone, bass, etc.; by the pitch, as B flat, E flat, etc.

Sarsaparilla, name of an order of dictyogens, the *Smilaceæ*. In pharmacy, the rhizome of *Smilax officinalis*, a native of Central America. The rhizome of sarsaparilla is popularly called the chump; one with roots and rootlets, the latter finely sub-

divided, is said to be bearded. Sarsaparilla is supposed to be diaphoretie, diuretie, demuleent, tonie, and alterative. It has been given with other medieines in syphilis, serofula, etc. Also, the sarsaparilla of Vera Cruz, *Smilax medica*, that of Peru *S. purhampuy*, that of Lisbon and Brazil *S. siphilitica*, that of Australia *S. glyeyphylla*. Many Asiatie speeies of smilax, as *S. zeylonica*, *S. glabra*, *S. perfoliata*, *S. leucophylla*, and *S. china*, and *S. aspera* and *S. excelsa*, from the S. of Europe — the last two sometimes ealled Italian sarsaparilla — furnish inferior qualities of the drug. The name is also applied to the *Aralia nudicaulis*, whieh grows wild in the United States and Canada.

Sarsen, Sarsden, Sessan, or **Sessen,** blocks of sandstone strewed over the Wiltshire downs and Southeast England. They are derived by denudation from the Lower London Tertiaries and the Bagshot Sands. Known also as greywethers, or Druid stones, or Druid sandstones. They were used in the eonstruetion of Stonehenge and Abury.

Sarsia, a genus of eœlenterate animals, belonging to the *Medusidæ* or jelly-fishes, and perhaps more properly regarded as the floating reproduetive buds or gonophores of fixed zoöphytes.

Sartain, John, an Ameriean artist; born in London, England, Oet. 24, 1808; eame to the United States in 1830, and was one of the first to introduee mezzotint engraving. In 1843 he became proprietor and editor of "Campbell's Foreign Semi-Monthly Magazine," and thereafter devoted himself to engraving and literary work. In 1848 he purehased a half interest in the "Union Magazine," afterward ealled "Sartain's Union Magazine," which he edited and illustrated during the four years of its existenee. Subsequently he held various offiees in the Artist's Fund Society, the Sehool of Design for Women, and the Pennsylvania Aeademy; was eleeted a member of the Society Artis et Amieitiæ in Amsterdam, Holland, in 1862, and in 1876 had eharge of the art department at the Philadelphia Centennial Exposition. He was the author of a large number of engravings for book illustration, and engraved many historieal paintings, ineluding Rothermel's "Battle of Gettysburg" and "The Iron Worker and King Solomon"; designed the monument to Washington and Lafayette in Monument Cemetery, Philadelphia; and published interesting personal reminiseences. He died in Philadelphia, Pa., Oct. 25, 1897.

Sarthe, a department of Franee, N. of the Loir; formed out of the old provinees of Anjou and Maine; area, 2,396 square miles. The Sarthe flows S. through the department, and the Loir W. along the S. border. The department is fairly level, and the soil fertile. Essentially an agricultural department, it produees wheat, oats, barley, and potatoes, sends its geese, ehiekens, eggs, eattle and swine to Paris, is famous for its breed of horses, and makes every year nearly 4,000,000 gallons of wine and 15,500,000 gallons of eider. Coal is mined, and there are manufaetures of hemp, linen, and eotton textiles, paper, glass, leather, machinery, etc. The departments are Le Mans, La Flèehe, Mamers, and St. Calais; eapital, Le Mans. Pop. (1906) 421,470.

Sarti, Giuseppe, an Italian musieal composer; born in Faenza, Italy, Dee. 1, 1729. He held the offiee of organist to the eathedral of Faenza from 1748 to 1750. The sueess of two operas, "Pompey in Armenia" (1751) and "The Shepherd King" (1753), brought him a royal invitation to Copenhagen in 1753; and there he remained till 1775. After his return to Italy he was successively direetor of the conservatory at Veniee (till 1779) and ehapel master of Milan eathedral; in this last post Cherubini was his pupil and assistant. During this period he eomposed some of his most sueeessful operas: "Rustic Jealousies" (1775); "Giulio Sabino" (1781); "The Marriage of Dorina" (1782); and others. In 1784 Catharine II. invited him to St. Petersburg. On his way he made the acquaintanee of Mozart at Vienna. His most notable produetions while in Russia were the opera "Armida" (1786) and a "Te Deum" in celebration of the taking of Otchakoff, in whieh real fireworks and eannon were diseharged to heighten the realism. He eomposed, in addition to operatie music, several masses, sonatas, and other pieees. He died in Berlin, July 28, 1802.

Sarto, Andrea del, one of the most distinguished painters of the 16th century; born near Florenee, Italy, July 16, 1486. His

ANDREA DEL SARTO.

proper name was Andrea d'Agnolo di Franeesco, the name del Sarto (of the Tailor) being applied to him from the oeeupation

of his father. He painted many frescoes in his native city, and Francis I. induced him to go to France in 1518. He soon returned to Italy, and having appropriated large sums which had been given him by his royal patron to purchase the pictures of great masters in Italy, he could not go back to France. Among his most important easel pictures are the "Sacrifice of Abraham" and the "Marriage of St. Catherine," in the gallery of Dresden; the "Madonna di San Francesco," an "Annunciation," and an "Assumption of the Virgin," at Florence; a "Deposition" from the Cross; a portrait of himself, and "Virgin and Child with St. Joseph." He is best known in galleries by his "Holy Families." He was highly distinguished for his excellence in fresco, and it was in this that his naturalness of design and careful execution became most apparent. He died in Florence, Jan. 22, 1531.

Sarto, Giuseppe. See PIUS X.

Sartorius, a flat and slender muscle, but the longest of the human body, extending obliquely from the upper and anterior part of the thigh to the superior, anterior, and inner part of the tibia. It serves to bend the leg obliquely inward, or to roll the thigh outward, and at the same time to bring one leg across the other, on which account it has received the name of sartorius, or "tailor's muscle."

Sarum. See SALISBURY.

Sasin, the common Indian antelope, *Antilope bezoartica* (or *cervicapra*): female destitute of horns, those of the male spiral, wrinkled at the base, annulated in the middle and smooth at the tip; head small, body light, legs long and slender; adult males dark above, white beneath, the nose, lips, and a circle round each eye white; small brushes of hair on the knees; females and young males under three years old tawny above, white beneath, with a light silvery band along the sides. It is common in India, where it herds in groups, one male to many females, with vigilant sentinels. Their flesh being lightly esteemed, they are not much hunted by Indian sportsmen.

Sasine, in Scotch law, a term used to signify either the act of giving legal possession of feudal property (in which case it is synonymous with infeftment), or the instrument by which the fact is proved.

Sasine Ox, a perquisite formerly due to the sheriff when he gave infeftment to an heir holding crown lands. It was afterward converted into a payment in money, proportioned to the value of the estate, and is now done away with.

Saskatchewan, a province of the Dominion of Canada, bounded on the N. by the district of Mackenzie, on the S. by the United States, on the E. by Manitoba and the district of Keewatin, and on the W. by Alberta. It extends from lon. 101° 25′ W. to lon. 110° W., and from the international boundary line to lat. 60° N. Its total area is 250,650 square miles, of which 8,318 square miles is under water.

Physical Characteristics.—The southern portion, from the international boundary line up to the Saskatchewan river, is chiefly a high and fertile prairie—broken here and there by a few ridges, but well watered and regarded as one of the greatest wheat-producing areas in the world. Above the Saskatchewan are forests which extend far to the N. and contain a vast supply of timber and pulp wood. There are many large lakes, including Lake Athabasca (the larger half of which is within the province), with a total area of 3,085 square miles and 700 feet above sea level; Reindeer lake, with an area of 2,490 square miles and 1,150 feet above sea level; Clear lake, Lac la Ronge, Lac à Plonge, White Loon, Doré, La Crosse, Montreal, Cumberland, Candle, Chaplin, and other lakes. The chief river, the Saskatchewan, whose North and South branches traverse the middle and southern portions of the province, flows northeasterly between lat. 52° and lat. 54° N., and then southeasterly through Keewatin into Lake Winnipeg. The Churchill flows easterly through the northern half of the province, and the Assiniboine, a tributary of the Red river, rises in the south. Other rivers are the Black, Geikie, Reindeer, and Beaver. Of the forested area the principal trees are the spruce, pine, tamarack, birch, and poplar.

Soil and Climate.—The soil is a rich black loam, like that of Manitoba, and, especially in the valleys, is admirably suited to wheat, oats, and barley, as well as root crops. The climate is dry, cold, and bracing in winter, and warm in summer. The western parts of the province are warmer in winter than the central and eastern, and many of the farm animals run at large both summer and winter. During summer an unusual proportion of sunshine favors the growth of grain. In the central portion of the province the mean temperature is about 61° in summer and 7.1° in winter. The average annual rainfall is about 15 inches.

Minerals and Mining.—Coal is found along the banks of the Saskatchewan, and for several miles along the North Saskatchewan river the sand has given quite a profitable gold return. The greatest mineral deposit of Saskatchewan is the coal in its southern portion. Mr. D. B. Dowling, of the Canadian Geological Survey, calculates that the coal-bearing areas there are capable of yielding over 26,000,000,000 tons, though most of it is lignite, or brown coal, of an inferior order. The hopeful feature about this is the rapid progress being made in the utilization of inferior coals as power producers. These coal areas have as yet been scarcely touched.

Saskatchewan

Fish and Game.—Whitefish, pickerel, sturgeon, gold-eyes, bass, and many other varieties abound in the lakes and rivers. The game found is practically the same as in Manitoba (*q. v.*).

Agriculture and Live Stock.—The methods of farming differ somewhat from those of Manitoba. The plan of summer-fallowing the land is practiced, and the yield of grain has been phenomenal. To develop the prairie land a considerable amount of capital in the form of equipment—horses, farm implements, reapers, and threshers—is needed, but the return is very quick, for in a year a single skillful farmer may have one hundred acres under crop and may receive on them a return of some $2,000 or $3,000. The immigrants from Europe, having no capital, go largely to the treed district, while Canadian and American immigrants, being better provided, settle on the prairie.

The liberal land policy and immense grain production have attracted during the opening years of the twentieth century a very large immigration. The number of farms increased from 13,380 in 1901 to 41,407 in 1906, a gain of 209 per cent. The wheat production in 1900, on 487,170 acres, was 4,306,092 bushels; in 1905, on 1,381,921 acres, the wheat crop was 31,799,198 bushels, an increase of 615 per cent. The oat crop in 1900, on 141,517 acres, was 2,270,057 bushels, and in 1905, on 606,346 acres, 25,623,849 bushels, a gain of 1,028 per cent. The barley crop in 1900, on 11,798 acres, was 187,211 bushels, and in 1905, on 40,732 acres, 1,196,419 bushels, a gain of 539 per cent. The wheat crop estimate in 1906, on 2,117,484 acres, was 50,329,432 bushels, an increase of 58 per cent. over 1905; oats, on 901,646 acres, were estimated at 41,885,285 bushels, an increase of 63 per cent.; barley, on 77,573 acres, 2,828,447 bushels, an increase of 136 per cent. The whole area in Saskatchewan devoted to wheat, oats, and barley increased from 640,485 acres in 1900 to 2,028,999 acres in 1905 and to 3,096,703 acres in 1906, gains of 216 per cent. and 383 per cent., respectively, over the acreage in 1900.

The raising of live stock is an important and highly profitable industry. The wide plains, the former home of the bison, or buffalo, afford large ranges for cattle and sheep, but especially horses. The number of horses increased from 83,461 in 1901 to 240,566 in 1906. During the same period the number of milch cows increased from 56,440 to 112,618; other horned cattle, from 160,613 to 360,236; sheep and lambs, from 73,097 to 121,290; swine, from 27,753 to 123,916. Cheese factories and creameries are numerous, and a large export trade in cheese and butter has been developed.

Manufactures and Transportation.—In a country so newly settled, manufacturing industry is naturally only in its infancy. The leading articles of manufacture are flour, lumber, furniture, cement, sashes and doors, etc. The Dominion census of 1906 showed that at the close of the calendar year 1905 Regina, Moosejaw, Prince Albert, and Saskatoon had a combined manufactured output valued at only $1,327,737, to which Prince Albert contributed $487,547 and Moosejaw $486,855. Of these four places Regina and Saskatoon did not, in 1900, have manufactures worth reporting in the Dominion census of 1901. The commercial importance of the province is based on the trade in grain, lumber, fish, and other natural products, and the railway transportation facilities afforded by the Canadian Pacific and Canadian Northern, two transcontinental lines which traverse the province, connecting it with the Atlantic and Pacific oceans, and with the trunk lines of the United States. The Grand Trunk Pacific, another transcontinental line—part of which, extending from Winnipeg eastward to Moncton, New Brunswick, is being constructed by the Dominion Government—was being built through the province in 1907. The Saskatchewan river is also important as a means of transportation, more than 1,000 miles of it being navigable.

Government and Finance.—The affairs of the province are administered by a lieutenant-governor, appointed by the governor-general-in-council, and a legislative assembly of 25 members. The lieutenant-governor is advised by an executive council of 4 members, which is responsible to the legislative assembly. Saskatchewan is represented by 4 members in the Dominion Senate and 10 members in the Dominion House of Commons.

The financial relations between the province and the Dominion are not in all respects similar to those which hold between the Dominion and the older provinces. For example, the former retains control of the public lands of Saskatchewan, and in compensation pays an annual allowance to the province. Saskatchewan is free from debt. The provincial budget of revenue and expenditure is prepared and passed by the legislature as in the other provinces.

Education and Religion.—The system of public education, which was enacted by the Dominion Parliament in 1903, is practically free and undenominational, though it still retains some features of the legislation for the Northwest Territories, out of which the province was created. By that legislation the educational rights of religious minorities were safeguarded, and the warrant for so doing was derived from the British North America Act of 1867 (the Act of Confederation). This resulted in the establishment of separate schools for Roman Catholics; and opposition to their continuance led to a compromise, whereby a half-hour at the

close of the school day was set apart for religious instruction for those legally entitled to demand it. In all other important respects the provincial government has full control, fixes the standard for teachers, prescribes the text-books, and administers a free and impartial public school system. There are provincial normal and high schools, but no provincial university, though preparations for establishing one were in progress in 1907.

No statistics of the numbers of the different religious denominations in the province are available. According to the Dominion census of 1901, the Northwest Territories, of which the area which is now Saskatchewan was a considerable part, contained 39,653 Roman Catholics, 31,659 Church of England, 30,987 Presbyterians, 26,636 Methodists, and 5,999 Baptists. Roughly speaking, about half of the total of these numbers may be assigned to what is now Saskatchewan.

Population and History.—The population of the province in 1906 was 257,763, as compared with 91,279 in 1901; in March, 1910, it was 377,590. The population of the chief cities and towns in 1906 was: Regina, the capital, 6,169; Moosejaw, 6,249; Saskatoon, 3,011; Prince Albert, 3,005; Indian Head, 1,545; Yorkton, 1,363; and Moosomin, 1,152. The province, which was formed out of the eastern half of the former district of Athabasca and the greater part of the former districts of Assiniboia and Saskatchewan, was proclaimed and admitted into the Dominion in 1905. See NORTHWEST TERRITORIES.

Saskatchewan, a river of the Northwest Territories, Canada, formed by two main streams, the South Saskatchewan or South Branch (called also the Bow river) and the North Saskatchewan or North Branch. The sources of these two streams are very near each other on the E. slope of the Rocky mountains. The South Branch flows S. E. to its junction with the Belly river, then N. E. to its junction with the North Branch. The North Branch flows N. past Mount Murchison, through Kutanie plain, then E. to its confluence with the South Branch. The course of the North Branch is about 836 miles, and of the South Branch, 903 miles. From their junction the river course is through the deserted bed of Lake Agassiz, then E. to its mouth in Lake Winnipeg. The total length is about 1,200 miles. From its mouth it is navigable, by the North Branch, about 1,000 miles. The river is narrow in the greater part of its course.

Sassafras, in botany: (1) a genus of *Lauraceæ:* dioecious, perianth six-parted, males with nine fertile stamens in three rows, anthers four-celled; females with nine sterile stamens; fruit fleshy. S. *officinale* (*Laurus sassafras*) is a large tree with yellowish flowers, growing in the United States. The dried leaves are very mucilaginous and are sometimes used for thickening soup. *S. parthenoxylon,* Oriental sassafras, growing in Sumatra, has medicinal qualities like those of *S. officinale.* (2) The English name of the genus, and of various trees more or less resembling it in properties, specifically, *Doryphora sassafras,* one of the plume nutmegs. The wood smells

SASSAFRAS OFFICINALE.

a, branch of male tree in flower; b, branch with ripe fruit and developed foliage.

like fennel (Australian). Brazilian sassafras is *Nectandra cymbarum.* In pharmacy, the dried root of *Sassafras officinale.* It is sold in branches, in pieces, or in chips, and is given as a stimulant and diaphoretic in chronic rheumatism, skin diseases, and syphilis. The bark is more powerful than the wood.

Sassafras Nuts. See PICHURIM BEANS.

Sassanidæ, a Persian dynasty of kings, which succeeded the Parthian dynasty of the Arsacidæ, and reigned from 226 B.C. to about A.D. 636. The dynasty began with Ardishír Babigán, and owes its name to the grandfather of that prince, named Sassan.

Sassari, a city of Sardinia, ranking next after the capital, Cagliari, which it has indeed attempted to supplant as the capital; 12 miles from the Gulf of Asinara, where its port, Porto Torres, is situated, and 162 miles N. by W. of Cagliari. A prosperous-looking town, with both old and new houses, embosomed in orange and olive groves, it has a cathedral (1531), an old castle (1327-1331), a university (1677, reopened in 1766) with about 120 students, a museum of Roman antiquities, a natural history collection, and a library (1556) of 25,000 volumes, and is the seat of an archbishop and of several of the old Sardinian nobles. There is a busy trade in grain, olive oil, cheese, and hides. Pop. (1901) 38,268.

Satellite, a subordinate attendant; an obsequious or subservient follower. Hence, in astronomy, a secondary planet revolving around a primary one. The moon is satellite to the earth. With it there are 21 satellites in the solar system. Mars has two, Jupiter five, Saturn eight, Uranus four, and Neptune one.

Satin, a silken fabric with an overshot woof and a highly finished surface. The woof is coarse, and hidden underneath the warp, which forms the surface. The warp is of organzine, the weft of tram. In a full satin twill there is an interval of 15 threads.

Satin Bird, the *Ptilonorhyncus violaceus*, a kind of bower bird. The adult male is conspicuous for the satin texture of its glossy black plumage. The younger bird is at first entirely of a dull green color, which gradually becomes mottled with black, and eventually changes entirely into that hue. Long before the construction of the nest, and quite independently of it, they, with consummate skill, weave an arbor-like gallery of uncertain length, in which they amuse themselves with the most active glee, the male displaying himself therein to attract the hen bird. The architecture of the bower is excessively tasteful, and scarcely a day passes without some fresh arrangement of the shells, feathers, bones, and other decorative materials, which they bring from long distances in the bush to ornament the bower and the platform on which it stands. They immediately appropriate every fragment placed within their reach when in confinement for the same purpose.

Satinet, a light kind of satin; also a glossy cloth made of a cotton warp and woolen filling, to imitate satin.

Satin Spar, in mineralogy, a finely fibrous variety of GYPSUM (*q. v.*) with a pearly luster when polished; also a fibrous variety of aragonite (Dana says calcite), giving a satin like aspect when polished; distinguished from the gypseous mineral by its greater hardness and its effervescence with acids.

Satin Wood, an ornamental cabinet-wood from the West and East Indies. The former is the better kind, and is chiefly derived from *Ferolia guianesis*. That from the East Indies is less white, and is produced by *Chloroxylon swietenia*, which also yields wood oil.

Satire, keenness and severity of remark; sarcasm; trenchant wit; biting ridicule; incisive humor; pungent irony; denunciation and exposure to derision or reprobation. In literature, the representation of follies or vices in a ridiculous form, either in discourse or dramatic action. The Romans were the first to distinguish themselves in this species of literature. The Roman satire was at first a kind of rude dramatic composition, filled with various matter and written in various kinds of verse, and took its name of *satura*, or *satira*, from the *lanx satura*, a dish filled with various kinds of fruits and herbs, which was carried in procession at the feasts of Ceres as the first fruits or gatherings of the season. These satires were set to music and repeated with suitable gestures, accompanied with the flute and dancing. They contained much ridicule and smart repartee; and hence poems characterized by these marks, and written to expose vice, got the name of satire. Lucilino was regarded by the Romans as the father of this species of composition, and was the first to introduce those principles of art which came afterward to be regarded as essential to it. His poems formed the models of the satires of Horace, the great master in this art, and whose humorous and playful raillery of the follies and foibles of mankind are ever fresh and ever true. He reproves with a smiling aspect, and while he moralizes like a philosopher he discovers at the same time all the politeness of a courtier. Juvenal is much more serious and declamatory. He has more strength and fire, and more elevation of style than Horace, but is at the same time greatly inferior to him in gracefulness and ease. Persius, the only other satirist of note whose works have come down to us, is a nervous and lively writer, but has more of the fire and force of Juvenal than of the politeness of Horace. Though the name satire usually is confined to poetical compositions, prose works of a satirical character are frequently included under the same head. Modern nations have not generally furnished many distinguished satirists. Among the French may be mentioned Rabelais, Montaigne, and Voltaire, and in England, Pope, Swift, Fielding, Byron, and Thackeray.

Satolli, Francis, a Roman Catholic delegate; born in Merciano, Perugia, Italy, July 21, 1831; was educated for the Church; appointed Professor of Dogmatic Theology at Urban College of the Propaganda, Rome; and was made archbishop in June, 1888. He was created president of the Academy of Noble Ecclesiastics; represented the Pope at the centenary of the Roman Catholic hierarchy in the United States in 1889; and was appointed the first apostolic delegate to the United States in 1893. He returned to Rome in 1896; died Jan. 8, 1910.

Satraps, in the ancient Persian empire, the governors of the provinces which were called satrapies. The power of the satrap, so long as he retained the favor of his sovereign, was absolute; he levied taxes at his pleasure and aped the capricious tyranny of his master unchecked.

Satsuma Ware, a fine kind of pottery or semi-porcelain made in Japan, having a

felspathic glaze of a light straw color, the surface of which is covered with a net-work of fine cracks. Red and green colors and dulled gold are employed for decorating the ware, a favorite ornament being the chrysanthemum, and pheasants and other fowls are also frequently introduced. Fine old Satsuma ware is highly esteemed by collectors.

Satterlee, Henry Yates, an American clergyman; born in New York city, Jan. 11, 1843; was graduated at Columbia University in 1863 and was ordained in the Protestant Episcopal Church in 1867. He served as rector of Zion Church, Wappinger's Falls, N. Y., in 1875–1882 and of Calvary church, New York city, in 1882–1896; was elected bishop and coadjutor of Ohio in 1887, and bishop of Michigan in 1889, but accepted neither. In 1896 he was consecrated Bishop of Washington. His publications include: "Christ and His Church," "New Testament Churchmanship," "A Creedless Gospel and the Gospel Creed," and "Life Lessons from the Prayer Book." He died Feb. 22, 1908.

Satterlee, Herbert Livingston, an American lawyer; born in New York city, Oct. 31, 1863; was graduated at Columbia University in 1883 and admitted to the bar in 1885. He served as William M. Evart's private secretary in 1886–1887; was navigator of 1st New York Naval Battalion in 1891–1895; colonel and aide to Gov. Levi P. Morton in 1895–1896; captain and aide to Gov. Frank S. Black in 1897–1898; and was lieutenant U. S. N. and chief of Capt. J. R. Bartlett's staff during the American-Spanish War. He was for several years president of the Naval Reserve Association, and early became a member of the American Social Science Association. His publications include "Political History of the Province of New York" (1885); etc.

Sattler, Eric E., an American physician; born in Cincinnati, O., Nov. 4, 1859; was graduated at the Miami Medical College in 1882 and then followed special courses in several foreign universities and in New York city. In 1890 he was a delegate to the International Medical Congress in Berlin. He devoted himself to the specialty of eye, ear, nose, and throat diseases. His publications include: "History of Tuberculosis" (1883), original researches in which is contained the first knowledge of nerve endings in the cornea and corneal epithelium; and many medical papers.

Saturation, the act of saturating, penetrating, or impregnating completely; the state of being saturated. In chemistry, that point at which a substance ceases to have the power of dissolving or combining with another.

Saturday (from Anglo-Saxon *Sæterdæg, Sæterndæg — Sæter, Sætern,* for Saturn, and *dæg,* a day — the day presided over by the planet Saturn), the seventh or last day of the week; the day of the Jewish Sabbath.

Saturn, in mythology, the youngest son of Cœlus (Uranus) and Gaia, the goddess of the earth. Being banished by Jupiter from heaven, he fled to Latium, and was received by Janus, King of Italy, who made him his partner on the throne. Saturn occupied himself in softening the barbarous manners of the people of Italy, and in teaching them agriculture and the useful and liberal arts. His reign there was so mild and beneficent that mankind have called it the Golden Age, to intimate the happiness and tranquillity which the earth then enjoyed. He is generally identified with the Greek Kronos (Time), and the festival in his honor, called "Saturnalia," corresponded with the Greek "Kronia." He is generally represented as an old man bent through age and infirmity, holding a scythe in his right hand. His temple was the State treasury.

Saturn, in astronomy, the 6th of the major planets in order of distance from the sun, and the outermost known to the ancients. With its eight satellites and wonderful ring system it is to be regarded as the most remarkable body in the solar system, as well as the most beautiful. The ball of the planet itself has a density of only five sevenths that of water, rotates on its axis (which is inclined about 27° to its orbit plane) in about 10 hours 14 minutes, is about 73,000 miles in mean diameter; but on account of its huge size and rapid rotation it has an ellipticity of about 0.10, its equatorial diameter being about 75,000 miles, and its polar diameter only about 68,000 miles. Its mean apparent diameter varies with its varying distance from the earth between 14″ and 20″. Its surface is marked by belts parallel to its equator, the equatorial ones being the brightest part of the surface, but they are not so decided as those of JUPITER (*q. v.*), and they have no permanent markings. The above rotation time was determined by Prof. Asaph Hall from a bright spot which suddenly appeared on the planet in 1876 and continued visible for several weeks.

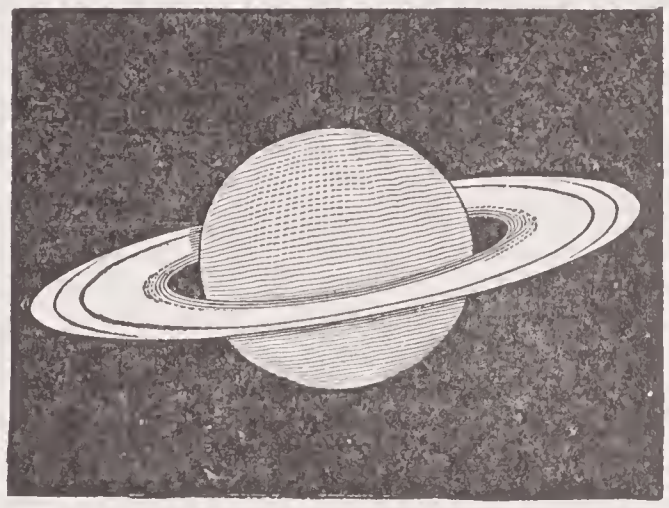
The ring system is the most remarkable feature, having an extreme diameter of about 168,000 miles and a width of about 36,000 or 37,000 miles. This width is divided into three principal parts, the outer ring about 10,000 miles wide, the middle ring about 16,500 miles wide, and the inner or dusky ring about as wide as the outer one. The division between the outer ones is sharp and permanent, and about 1,600 miles wide. The bright middle ring fades

into the dusky one without any sharp boundary line between them. This dusky ring comes within about 9,000 or 10,000 miles of the planet's equator. It was not discovered till November, 1850, and then by W. C. Bond, of Cambridge, Mass., and about two weeks later, independently, by Dawes, of England. It is not at all prominent at any time, and only visible with a good telescope. It is semi-transparent, the outline of the bright ball of the planet being plainly visible through it; but this is entirely cut off by the other two rings. Whether a bright star would be visible through these is doubtful. The opportunity for a test of this by an occultation, since the employment of good telescopes, has not occurred. The rings are extremely thin, probably not more than 100 miles thick. When seen edgewise, as they are once in every 15 years, they entirely disappear except in the largest telescopes. At the intermediate times, when they are at their widest, the minor axis of the ellipse is about one half of the major, and the outer edge of the ring extends beyond the ball of the planet all the way round. The outer ring is sometimes, under the best condition of seeing, apparently divided into two by a division which has been named Encke's division. But this does not seem to be permanent, and is generally only a fine dark streak on the ring or entirely invisible. It is certain that the rings must be made of simply a cloud of discrete particles or satellites of some kind, each moving round with its own velocity according to its distance from the planet, except as it may be modified by collision with other particles or masses. No other construction of the rings could be a stable one.

Satellites.— The principal elements of the satellite system of Saturn are as follows:

Saturn

urn as our moon does toward the earth. Titan is as bright as a 9th magnitude star, and is by far the largest of the satellites of Saturn. It is probably 3,000 or 4,000 miles in diameter, and its mass is estimated at about 1 : 4600 that of Saturn. Its large mass and its nearness to Hyperion cause large perturbations in the orbit of the latter, so much so that Hyperion's motion has been for a long time a puzzle to astronomers, and it is only lately that it is coming to be understood as offering a new case



SATURN, THE PLANET.

in celestial mechanics, which must be attacked by new methods of analysis. The perturbations of Titan keep the line of apsides of Hyperion's orbit in the line of conjunction with Titan, forcing the line to retrograde rapidly, whereas it would have a progressive motion according to the usual law of perturbations. The large outside orbit of Iapetus has an inclination of about 10° to the plane of the rings, but all the other satellites move exactly in that plane,

No.	Name.	Discovery.	Distance.		Sidereal Period.			
			Radius of Planet.	Miles.	D.	H.	M.	S.
1	Mimas	W. Herschel, 1789	3.11	117,000	0	22	37	5.7
2	Enceladus	" " "	3.98	157,000	1	8	53	6.3
3	Tethys	J. D. Cassini, 1684	4.95	186,000	1	21	18	25.6
4	Dione	" " "	6.34	238,000	2	17	41	9.3
5	Rhea	" " 1672	8.86	332,000	4	12	25	11.6
6	Titan	Huyghens, 1655	20.48	771,000	15	22	41	23.2
7	Hyperion	G. P. Bond, 1848	25.07	934,000	21	6	39	27.0
8	Iapetus	J. D. Cassini, 1671	59.58	2,225,000	79	7	54	17.1
9	Phœbe	W. H. Pickering, 1899	.....	8,000,000	About 17 months.			
10	Themis	" " 1905	.....	.....	.....			

Hyperion was also independently discovered by Lassel at Liverpool only two days later than Bond's discovery. The range of the satellite system is enormous. The period of Iapetus is almost as long as that of Mercury. Iapetus is also remarkable for its variations in brightness. On the W. side of the planet it is about twice as bright as on the E., which shows that it rotates once on its axis during one revolution, keeping the same face toward Sat- and the orbits of the five inner ones are sensibly circular.

The discovery of Phœbe, the 9th satellite of Saturn, was announced March 18, 1899, by Prof. William H. Pickering, of the Harvard Observatory, Cambridge, Mass. The satellite appears on four plates taken at Harvard's Arequipa station, South America, with the Bruce photographic telescope. Saturn's new moon is the only one that has been discovered by means of photography.

Saturn's Rings

As to Saturn's physical condition, it is possible to advance at present only the most uncertain conjecture. "The planet," says Professor Pickering, "seems to be a mere dead mass of clouds, and, saving for a few faintly marked belts, to be as structureless and uninteresting as the planet Venus. It gives no evidence of those rapid currents and violent outbursts, due, presumably, to intense internal heat, that render Jupiter such an interesting body when viewed through a large telescope."

Saturn's Rings. Only a few years have elapsed since James E. Keeler, director of the Lick Observatory in California, made the remarkable spectroscopic observations which gave for the first time an ocular demonstration of the true character of those mysterious luminous rings surrounding the brilliant planet Saturn. Though these observations were carried out several years ago (1895), they have not yet been made sufficiently accessible to the public at large, nor have they been generally valued at their true worth. We have called this work of Keeler's interesting because the problem of the rings has been a classic one for many generations; and we have been particular, also, to call it significant, because it is pregnant with the possibilities of newer methods of spectroscopic research, applied in the older departments of observational astronomy.

The troubles of astronomers with the rings began with the invention of the telescope itself. They date back to 1610, when Galileo first turned his new instrument to the heavens. It may be imagined easily that the bright planet Saturn was among the very first objects scrutinized by him. His "powerful" instrument magnified only about 30 times, and was doubtless much inferior to our pocket telescopes of today. But it showed at all events that something was wrong with Saturn. Galileo put it, "*Ultimam planetam tergeminam observavi*," "I have observed the farthest planet to be triple." It is easy to see now how Galileo's eyes deceived him. For a round luminous ball like Saturn, surrounded by a thin flat ring seen nearly edgewise, really looks as if it had two little attached appendages. Strange, indeed, it is today to read a scientific book so old that the planet Saturn could be called the "farthest" planet. But it was the outermost known in Galileo's day, and for nearly two centuries afterward. Not until 1781 did William Herschel discover Uranus; and Neptune was not disclosed to the marvelous mathematical perception of Le Verrier and Adams until after 1840.

Galileo's further observations of Saturn bothered him more and more. The planet's behavior became much worse as time went on. "Has Saturn devoured his children, according to the old legend," he inquired soon afterwards. For the changed positions of earth and planet in the course of their motion around the sun in their respective orbits had become such that the ring was seen quite edgewise, and was, therefore, perfectly invisible to Galileo's "optic tube." The puzzle remained unsolved by Galileo; it was left for another great man to find the true answer. Huygens in 1656 first announced that the ring was a ring.

The manner in which this announcement was made is characteristic of the time; today it seems almost ludicrous. Huygens published a little pamphlet in 1656 called "De Saturni Luna Observatio Nova," or, "A New Observation of Saturn's Moon." He gave the explanation of what had been observed by himself and preceding astronomers in the form of a puzzle, or "logogriph." Here is what he had to say of the phenomenon in question:

"aaaaaaa ccccc d eeeee g h iiiiiii llll mm nnnnnnnn oooo pp q rr s ttttt uuuuu." It was not till 1659, three years later, in a book entitled "Systema Saturnirium," that Huygens rearranged the above lettters in their proper order, giving the Latin sentence: "*Annulo cingitur, tenui plano, nusquam cohaerente, ad eclipticam inclinato.*" Translated into English this sentence informs us that the planet "is girdled with a thin, flat ring, nowhere touching Saturn; and inclined to the ecliptic!" This was a perfectly correct and wonderfully sagacious explanation of those complex and exasperatingly puzzling phenomena that had been too difficult for the master hand of Galileo himself. It was an explanation that explained.

But of far greater interest than the mere fact of their existence is the important cosmic question as to the constitution, structure, and, above all, durability of the ring system. Astronomers often use the term "stability" with regard to celestial systems like the ring system of Saturn. By this they mean permanent durability. A system is stable if its various parts can continue in their present relationship to one another without violating any of the known laws of astronomy. Whenever we study any collection of celestial objects, and endeavor to explain their motions and peculiarities, we always seek some explanation not inconsistent with the continued existence of the phenomena in question. For this there is perhaps no sufficient philosophical basis. Probably much of the great celestial procession is but a passing show, to be but for a moment in the endless vista of cosmic time.

However this may be, we are bound to assume that Saturn has always had these rings, and will always have them; and it is for us to find out how this is possible. The problem was first attacked mathematically by various astronomers, including

Saturn's Rings

Laplace; but no conclusive mathematical treatment was obtained until 1857, when James Clerk Maxwell proved in a masterly manner that the rings could be neither solid nor liquid. He showed, indeed, that they would not last if they were continuous bodies like the planets. A big solid wheel would inevitably be torn asunder by any slight disturbance, and then precipitated upon the planet's surface. Therefore, the rings must be composed of an immense number of small detached particles, revolving around Saturn in separate orbits, like so many tiny satellites.

This mathematical theory of the ring system being once established, astronomers were more eager than ever to obtain a visual confirmation of it. We had, indeed, a sort of analogy in the assemblage of so-called "minor planets" or "asteroids," which are known to be revolving around our sun in orbits situated between Mars and Jupiter. Some hundreds of these are known to exist, and probably there are countless others too small for us to see. Such a swarm of tiny particles of luminous matter would certainly give the impression of a continuous solid body, if seen from a distance comparable to that separating us from Saturn. But arguments founded on analogy are of comparatively little value. Astronomers need direct and conclusive telescopic evidence, and this was lacking until Keeler made his remarkable spectroscopic observations in 1895. The spectroscope is a peculiar instrument, different in principle from any other used in astronomy; we study distant objects with it by analyzing the light they send us, rather than by examining and measuring the details of their visible surfaces. The reader will recall that according to the modern undulatory theory, light consists simply of a series of waves. Now the nature of waves is very far from being understood in the popular mind. Most people, for instance, think that the waves of ocean consist of great masses of water rolling along the surface. This notion doubtless arises from the behavior of waves when they break upon the shore, forming what we call "surf." When a wave meets with an immovable body like a sand beach, the wave is broken and the water really does roll upon the beach. But this is an exceptional case. Farther away from the shore, where the waves are unimpeded, they consist simply of particles of water moving straight up and down. None of the water is carried by mere wave action away from the point over which it was situated at first. Tides or other causes may move the water, but not simple wave motion alone. That this is so can be proved easily. If a chip of wood be thrown overboard from a ship at sea it will be seen to rise and fall a long time on the waves, but it will not move. Similarly, wind waves are often quite conspicuous on a field of grain; but they are caused by the individual grain particles moving up and down. The grain cannot travel over the ground, since each particle is fast to its own stalk.

But while the particles do not travel, the wave disturbance does. At times it is transmitted to a considerable distance from the point where it was first set in motion. Thus, when a stone is dropped into still water, the disturbance (though not the water) travels in ever-widening circles, till at last it becomes too feeble for us to perceive. Light is just such a traveling wave disturbance. Beginning, perhaps, in some distant star, it travels through space, and finally the wave impinges on our eyes like the ocean wave breaking on a sand beach. Such a light wave affects the eye in some mysterious way we call "seeing."

The spectroscope enables us to count how many waves reach us each second from any given source of light. No matter how far away the source of stellar light may be, the spectroscope examines the character of that light and tells us the number of waves set up every second. It is this characteristic of the instrument that has enabled us to make some of the most remarkable observations of modern times. If the distant star is approaching us in space, more light waves per second will reach us than we should receive from the same star at rest. Thus if we find from the spectroscope that there are too many waves, we know that the star is coming nearer; and if there are too few, we can conclude with equal certainty that the star is receding. Keeler was able to apply the spectroscope in this way to the planet Saturn and to the ring system. The observations required dexterity and observational manipulative skill in a superlative degree. These Keeler had; and this work of his will always rank as a classic observation. He found by examining the light waves from opposite sides of the planet that the luminous ball rotated; for one side was approaching us and the other receding. This observation was, of course, in accord with the known fact of Saturn's rotation on his axis. But with regard to the rings, Keeler showed in the same way the existence of an axial rotation, which appears not to have been satisfactorily proved before, strange as it may seem. But the crucial point established by the spectroscope was that the interior part of the rings rotates faster than the exterior. The velocity of rotation diminishes gradually from the inside to the outside. This fact is absolutely inconsistent with the motion of a solid ring; but it fits in admirably with the theory of a ring comprised of a vast assemblage of small separate particles. Thus, for the first time, astronomy comes

into possession of an observational determination of the nature of Saturn's rings, and Galileo's puzzle is forever solved.

HAROLD JACOBY.

Saturnalia, the feast in honor of Saturn, celebrated by the Romans in December, and regarded as a time of unrestrained license and merriment for all classes, even for the slaves. Hence, any time of noisy license and revelry; unrestrained, licentious revelry.

Satyr, in mythology, one of a number of rural deities of Greece, identical with the Fauni of the Latins. They are regarded as the attendants of Bacchus, and are represented as roaming through the woods, dwelling in caves, and endeavoring to gain the love of the Nymphs. They are usually represented with the feet and legs of goats, short horns on the head, and the body covered with thick hair.

Saucisse, or **Saucisson,** in fortifications: (1) a powder-hose for communicating fire to a charge in military mining. It consists of a long pipe or bag made of cloth well pitched, or of leather, and extends from the chamber of a mine to the entrance of the gallery. The powder is generally placed in a wooden pipe to preserve it from damp. (2) A long, stout bundle of faggots, larger than a fascine. They are commonly used to cover men, to make epaulements, traverses, or breastworks in ditches full of water, to render the way firm for carriages.

Sauer Kraut, or **Sour Krout,** a favorite German dish, consisting of cabbage cut fine, pressed into a cask, with alternate layers of salt, and suffered to ferment until it becomes sour.

DAVID PLAYING BEFORE SAUL: PAINTING BY SCHICK.

Saugerties, a town and village in Ulster county, N. Y.; at the junction of the Hudson river and Esopus creek and on the West Shore railroad; 12 miles above Kingston, the county seat. It is in an agricultural region; has abundant water power; and is principally engaged in the manufacture of iron and paper and the growing of small fruit. In the vicinity of the village are quarries of fine limestone. The village has several churches, banks, and a daily and weekly newspaper. Pop. (1900) town, 9,754; village, 3,697.

Saugor. See SAGAR.

Sauk Center, a city in Stearns county, Minn.; on the Sauk river and the Great Northern and Northern Pacific railroads; 117 miles N. W. of St. Paul. Pop. (1900) 2,220.

Saul, King of Israel from about 1095 to 1056 B. C.; the son of Kish, a Benjamite. Selected for this office by Samuel, he obtained, by his personal courage and military capacity, several successes over the Philistines, Edomites, Moabites, and Ammonites, by means of which he consolidated the

tribes and confirmed his authority. After a long reign the wild nature of the king at length showed itself in a kind of religious frenzy. This frenzy, which is briefly described in the Bible as an "evil spirit of God," led him to the massacre of the priests of Nob and various similar excesses. Meanwhile the prophet Samuel, estranged by the king's misdeeds, had anointed David as his successor, and this took effect when Saul was slain on Mount Gilboa.

Saulcy, Louis Félicien Joseph Caignart de (sō-sē'), a French antiquarian; born in Lille, France, March 19, 1807. He first obtained special attention as a numismatist by his "Essay on the Classification of Byzantine Coinage" (1836). Among his works are: "Campaigns of Julius Cæsar in Gaul" (1862); "Tour in the Holy Land" (1865); "Last Days of Jerusalem" (1866); "Story of Herod" (1867); and "Seven Centuries of Jewish History" (1874). He died in Paris, Nov. 3, 1880.

Sault Ste. Marie, a city and county-seat of Chippewa co., Mich.; on St. Mary's river, St. Mary's Falls ship-canal, and on the Duluth, South Shore, and Atlantic, and the Minneapolis, St. Paul, and Sault Ste. Marie railroads; opposite a village of the same name in Canada, with which it is joined by a railroad bridge. It contains a branch State fish hatchery, waterworks, an electric street railroad, electric lights, a National bank, and several weekly newspapers. The city is a local trade center for a large lumbering, agricultural, and commercial fishery territory. The lumber interests, fur trade, and fishing are the principal industries. There is an assessed property valuation of over $7,500,000. Pop. (1900) 10,538; (1910) 12,615.

Sault Sainte Marie Falls. See St. Mary's River.

Sault Ste. Marie Canal. The "Mining Journal" of Marquette, Mich., contained the following account of the history of the construction of the first canal at Sault Ste. Marie, Mich.:

"After much solicitation (in which Hon. Peter White, Hon. John Burt, Heman B. Ely, General Cass, Governor Felch and James L. Conger and others were active) Congress on Aug. 26, 1852, appropriated 750,000 acres of land for the construction of the Sault Ste. Marie ship canal. But the action of Congress was not taken without opposition. It seemed impossible for some of the older members to conceive of any sudden growth of our country such as we are familiar with. The Pacific railroads were not dreamed of, Alaska was a region in close proximity with the North pole; and yet today one of the most familiar trips made is along the lines of these railroads and to this much-dreaded Arctic region. When the canal around the rapids of Sault Ste. Marie was contemplated many were opposed to it, and Henry Clay of Kentucky, took occasion to speak of the work as one beyond the range of the remotest settlements of the United States or of the moon. But the general government having acted favorably, the Legislature of the State of Michigan gave its approval and the governor on Feb. 12, 1853, was authorized to appoint the following commission to construct the canal: Chauncey Joslin, Henry Ledyard, John P. Barry, Shubial S. Conant and Alfred Williams. These gentlemen in April, 1853, entered into a contract with Joseph Fairbanks, J. W. Brooks, Erastus Corning, August Belmont, H. Dwight, Jr., Thomas Dyer, principals, and Franklin Moore, George T. Porter, John Owen, Henry P. Baldwin and James F. Joy, sureties. These were some of the terms of the contract: The canal was to be finished May 21, 1855, and two combined locks were to be built, 350 feet long and 70 feet wide, with 12 feet of water on the miter sill, this afterward being increased to 13 feet; and the canal which was to extend to the head of the rapids to be 5,548 feet in length. On the date named a certificate was signed to the completion of the canal by Kingsley S. Bingham, Governor Shubial S. Conant, Chauncey Joslin, Henry Ledyard and Alfred Williams. A certificate was also signed by John T. Clark, engineer, on May 2, and thus one of the most remarkable engineering works was completed, and one that had an immense effect on the development of the country. The estimated cost was $557,739, but the actual cost was nearly double, being $999,802.46. When we consider all the conditions under which this canal was built we are filled with astonishment. No such canal and locks up to that time had ever been constructed, and the only experience to be had was from the Erie canal, where the width was only 70 feet and the depth seven feet, the lock being 96 feet long, and about 20 feet wide, with a lift of about 10 feet. Perhaps in an ordinary climate the construction in the time given would not have been prohibitory, but in the region of Lake Superior, where winter commences in October in some years and extends till the middle of May, the season was altogether too short. There was no labor to be had near at hand and cholera broke out among the laborers so that everything seemed to oppose the completion of the work, and if there had not been wonderful energy displayed, and if the directors had not been almost prodigal in the expenditure of money, the work would have been a failure; as it was, the value of the land that was received at the time was compensation for the money expended."

Saunders, Alvin, an American legislator; born in Fleming Co., Ky., July 12,

1817; removed to Illinois in 1828; and later to Iowa, then a part of Wisconsin Territory, where he was postmaster for seven years; studied law, but instead of practising continued in business and became a banker. He was a member of the convention which framed the constitution of Iowa in 1846; State senator for eight years; member of the Republican National Conventions of 1860 and 1868; commissioner to organize the Pacific Railroad Company; governor of the Territory of Nebraska in 1861–1867, when Nebraska was admitted to the Union. He served in the United States Senate in 1877–1883, during which time he was active in helping to secure the resumption of specie payment, and in obtaining 600,000 acres for Nebraska by the straightening of its N. boundary. He died in Omaha, Neb., Nov. 1, 1899.

Saunders, Frederick, an American librarian; born in London, England, Aug. 14, 1807. He came to the United States in 1837 and was librarian of the Astor Library, New York, 1859–1896. He wrote: "Memoirs of the Great Metropolis" (London, 1852); "New York in a Nut-Shell" (1853); "Salad for the Solitary, by an Epicure" (1853); "Salad for the Social" (1856); "Pearls of Thought, Religious and Philosophical, Gathered from Old Authors" (1858); "Mosaics" (1859); "Festival of Song" (1866); "About Women, Love, and Marriage" (1868); "Evenings with the Sacred Poets" (1869; enlarged 1885); "Pastime Papers" (1885); "Story of Some Famous Books" (1887); and "The Book-Lover's Library." He died Dec. 12, 1902.

Saunders, Richard, the name under which Benjamin Franklin published his almanac, 1732–1757.

Saunderson, Nicholas, a British mathematician; born in Thurlstone, England, in January, 1682. He lost his eyesight in infancy, but received a good education in both classics and mathematics. In 1707, he delivered in Cambridge a series of lectures on the Newtonian philosophy, including Newton's theory of optics. Four years afterward he was appointed Lucasian Professor of Mathematics. He was on friendly terms with Newton, Demoivre, Halley, and other eminent mathematicians among his contemporaries. He wrote "Elements of Algebra" (2 vols. 1740); and "Fluxions," including a discussion of the principal propositions in Newton's "Principia," (1756). It is said that, in spite of his blindness, he understood the rules of perspective, the projections of the sphere, and some of the more recondite propositions of solid geometry. He died April 19, 1739.

Saunière, Paul (sōn-yar'), a French story-writer; born in Paris in 1827. He wrote: "The Fatal Prediction"; "The Bluebeard Nobleman"; "Father Grabpenny"; "King Misery" (1868); "Miss Aglaë" (1874); "The True Adventures of Jean Barchalou" (1876); "A Son-in-Law at Any Cost" (1879); "The Nephew from America" (1881); "The Little Marquise" (1883); "Mother Michel" (1886); "A Daughter of the Pharaohs" (1888); "Quicksilver" (1889); "The Recluse of Montfleury" (1889). He died Nov. 21, 1894.

Sauria, or Saurians, an order of reptiles, including all those which, like the crocodile and lizard, are covered with scales and have four legs. The most gigantic and remarkable specimens of saurian reptiles are now extinct, but their fossil remains, immense in size and wonderful as they appear, afford incontestable evidence of their similarity in structure to the harmless little lizard of the present day. The diversity in the habits of the existing saurians is very considerable — some being more or less aquatic, others strictly terrestrial, while others are essentially arboreal. The greater part feed on animal substances; some of them preferring fish, and others attacking small animals, while some are entirely insectivorous, and a few are herbivorous. They are all furnished with teeth, which are of a simple conical form, and adapted rather for securing and tearing their prey than for masticating it; their toes are generally furnished with claws, and they all have a tail more or less strong, and generally very thick at the base. A few species, exceptions to the general character, have only two legs.

Ancient American Saurians.— The vast region known as the Western plains, so interesting to visitors, not more on account of the unparalleled magnificence of the scenery than of the curious and wonderful development of its geological features, including, as it does, the tremendous cañons of Colorado, the lava fields of Dakota, the strange painted cliffs of the National Park and the extraordinary geyser region of Wyoming, is the paradise of the palæontologist, for here lived and died the uncounted generations of reptiles that peopled the ancient earth and the waters of North America during the Mesozoic era. But, while all this region affords fruitful fields to the fossil hunter, Kansas has proved the most prolific tract for those who, like Prof. S. W. Williston, have made something of a specialty of ancient American sea saurians. Of the 25 or 30 species which as yet have been found distinctive among all the specimens collected, Dakota has contributed three, Mississippi, Alabama, Carolina and New Jersey, together, about 10, and Kansas 12. Though expeditions, extending from 1854 up to the present time, have been engaged in collecting fossil remains in the territory described, the supply is still unexhausted, and is con-

sidered by those who have perhaps the best information to be proeured on the subjeet, inexhaustible. In this they may be mistaken, but it cannot be denied that though the number of tons of materiał of this kind whieh has been reeeived by our museums and eolleges is not easy to estimate exaetly, and though room ean with difficulty be found for what is already possessed, the cry is still it eomes. Indeed, considering the perishable nature of osseous substanee it is really wonderful that anything at all, except perhaps the impressions of parts of animals or their footprints in damp soils that have hardened into roek, should remain to us of vertebrates which lived on the earth at sueh very remote periods of time. The strueture of bone is sueh that under ordinary eireumstanees more or less rapid deeay must necessarily ensue upon its exposure to atmospherie and aqueous ageneies. The hardest bone is traversed with what are ealled Haversian eanals, winding passages which are eonneeted by still smaller passages with lacunæ, and the less solid takes the form of cellulated substance permeated with sareodic matter, while the long bones are generally hollow and contain marrow, whose corruption and decay, together with that of all the soft tissues occupying bone eavities, infeets the ossein, and by breaking away the delieate partitions between tubuli, and by softening all adjaeent parts, hastens its disintegration. The labyrinthine system of passages whieh pervades the whole bony structure, enlarged and emptied of the soft organic matter that occupied it, readily admits water and beeomes filled with it. This not only carries vegetable aeids that tend to deeompose the bone, but in freezing expands and pulverizes it as effeetually as if it had been pounded to pieces with a hammer.

Quite as surely subjeet to destruetion are the bones of animals deposited on beds of seas or oceans. Sea water is a slow but almost universal solvent. The dredges of the United States fish commission steamer "Albatross" and of the "Fish Hawk," as well as those of the numerous other vessels which have from time to time explored the bottom of the ocean, have been dragged many miles without bringing to light any other remains of vertebrate animals than a few shark's teeth. It may, therefore, be readily seen what a very small proportion as compared with the original supply of these bones can have escaped destruction in undergoing the vieissitudes of such an enormous length of time, and from this may be argued the populousness of the Western plains during past geologieal ages.

The gradual development of new species and genera, and the inerease of the numbers of individuals eomposing them, of the saurians of the Mesozoic era, in the æons preceding the attainment of the highest point in the scale of physieal organization reaehed by reptiles during the Jura Trias period, was indeed, it is believed, so great and extensive that the land areas inhabited by them beeame overcrowded. It was then that animals best adapted in form and by habits of life to do so began to look to the water for food and, in time of danger, for refuge. In this way the sea, previously monopolized by ammonites, sharks and euttlefish, beeame the home of reptiles.

It is well known that by some little-known law of nature, eertain species of fish, carp for instanee, are able to accommodate their growth to the size of the area of water aeeorded them to swim in, and it seems neeessary to eonjeeture a freer and more extensive working of some such law to aeeount for a proeess of development by virtue of whieh insignificant little land lizards, such as the nothosaurus and the *Isodectes punctulatus*, were able to take upon themselves the colossal proportions and transform their digital limbs into the paddles of the elasmosaurs, plesiosaurs and mososaurs, and the ichthyosaurs, whose remains are so characteristic of the cretaceous fossil beds of Europe and Ameriea.

The elasmosaurs more nearly resembled a snake bird (ahinga) in form than they did any other ereature now living. They were found from 30 to 60 feet in length. Prof. Edward Drinker Cope, the celebrated palæontologist, has furnished a very graphic description of the elasmosaurs:

"Far out on the expanse of the ancient sea," writes the professor, "might have been seen a huge snake-like form which rose above the surfaee and stood ereet with tapering throat and arrow-shaped head, or swayed about describing a eircle of 20 feet radius above the water. Then plunging into the depths naught would be visible but the foam caused by the disappearing mass of life. Should several have appeared together we ean easily imagine tall flexible forms rising to the height of the masts of a fishing fleet, or like snakes twisting and knotting themselves together. This extraordinary neck (for such it was) rose from a body of elephantine proportions. The limbs were two pairs of paddles like those of the plesiosaurus, from whieh this diver chiefly differed in the arrangement of bones in the breast."

The general appearanee and the habits of mososaurs have been mueh misunderstood and their size has been exaggerated. The largest of these reptiles, *Mososaurus horridus*, was certainly not more than 50 feet long. The skeletons of mososaura, found in the fossil beds of North Ameriea, do not average more than from 16 to 20 eet in length. Their proportions have always, up to the present time, been described as serpent-like, and they have been called sea serpents. That they anticipated

a number of the anatomical peculiarities of the serpents cannot be denied, but their shapes, as is convincingly shown by an almost complete medallion skeleton upon a slab of rock, with the bones scarcely displaced, in the New York Museum of Natural History, were no more snake-like than are those of alligators. Like the elasmosaurs they had two pairs of paddles. These paddles had webbed digits and were attached to the body in such a manner as to admit considerable freedom of action. Their tails were flattened and much longer than those of the elasmosaurs. Their heads were flat, as are the heads of alligators, and wedge-shaped. Their mouths, armed with four rows of formidable teeth on the roof of the mouth, besides those in the lower jaw, opened so widely, being jointed very far back between the ear and the chin, that though they had not the expandable throats of serpents they could have found no difficulty in swallowing their prey alive. They were covered with small scales like those of a lizard or serpent. Strange to relate, a portion of the scaled hide of a mososaur has been discovered in an excellent condition of preservation. The tongues of mososaurs were long and forked.

Elasmosaurs were beasts of prey and without doubt lived upon whatever they could seize and kill, principally fish, for they were more likely to capture them than they were to take other prey, and fish bones and scales are found associated with their remains. They had long paddles and were built for speed. Professor Cope fancies that they may have secured and held their prey with their forward paddles. Elasmosaurs were exclusively marine animals. It is not probable that they ever came ashore. Mososaurs were more formidable reptiles than were elasmosaurs. It is not probable that any animal living during the existence of their type could have withstood their attack. It is possible that mososaurs may have come ashore occasionally voluntarily, but it is problematical. From their plan of structure it is evident their prey must have been the largest creatures that inhabited the waters in which they swam, and it is not at all unlikely they may have attacked and sometimes devoured plesiosaurs and elasmosaurs, as well as smaller species of mososaurs and the great marine turtles of that day.

Saurin, Jacques, a French preacher; born in Nîmes Jan. 6, 1677; studied at Geneva, and was chosen minister of a Walloon Church in London in 1701. The climate of England did not agree with his delicate health, and in 1705 he settled at The Hague where his extraordinary gift of pulpit oratory was greatly admired. At length his clerical brethren enviously assailed him with the accusation of heresy. The dispute was carried to the synod of The Hague, and Saurin was subjected to a series of petty persecutions that shortened his days. He died in The Hague Dec. 30, 1730. As a preacher he has often been compared with Bossuet, whom he rivals in force if not in grace and subtlety. His chief productions are "Sermons" (12 vols. 1749); "Discourse on the Most Memorable Events in the Old and New Testaments" (1720–1728), often called Saurin's Bible; and "The State of Christianity in France" (1725).

Sauropsida, a primary group or province of vertebrata, comprising reptiles and birds. An epidermic skeleton, in the form of scales or feathers, is almost always present. The centra of the vertebræ are ossified, but have no terminal epiphyses; the skull has a completely ossified occipital segment; mandible always present, and each ramus consists of an articular ossification, connected with the skull by quadrate bone. The apparent ankle joint is situated between the proximal and distal divisions of the tarsus, not between the tibia and the astragalus, as in the mammalia. The heart is tri- or quadri-locular, and some of the blood corpuscles are red, oval, and nucleated. Respiration is never effected by means of branchiæ, but after birth is performed by lungs. The cerebral hemispheres are never united by a *corpus calasum*. The reproductive organs open into the cloaca; the oviduct is a Fallopian tube with a uterine dilatation in the lower part. All are oviparous or ovoviviparous; there are no mammary glands; the embryo has an amnion and a large respiratory allantois, and is nourished at the expense of the massive vitellus.

Sauroramphus, a genus of *Hoplopleuridæ*, having the lower jaw produced beyond the upper. It appears in the chalk formation and extends into the Tertiary.

Saururæ, lizard-tailed birds, made by Huxley a sub-class of Aves. The metacarpals are well-developed, not anchylosed The caudal vertebræ are numerous and large, so that the caudal region is longer than the body, whereas in other birds it is shorter; furculum complete and strong; foot extremely passerine; skull and sternum unknown. It contains the single genus *Archæopteryx*.

Saururus, the typical genus of *Saurutaceæ*. The root of *S. cernuus*, made into a poultice, is applied in pleurisy. The scientific name is in allusion to the form of the flower spike.

Saurus, in ichthyology, a genus of *Scopelidæ*, with 15 species of small size, from the shores of tropical and sub-tropical regions. It includes a sub-genus *Saurida*.

Saury, the *Scomberesox saury*, a fish called also the skipper. It is from 12 to 18 inches long, about an inch in depth, and the

jaw has a hinge movement as in Belone. The name is sometimes extended to the whole genus *Scombcresox.*

Sausage, an article of food, consisting of chopped or minced meat, as pork, beef, or veal, seasoned with sage, pepper, salt, etc., and stuffed into properly cleaned entrails of the ox, sheep, or pig, twisted at short intervals into sections. When sausages are made on an extensive scale the meat is minced and stuffed into the intestines by machinery.

Sausage Poison, the poisonous agent or principle existing in sausages made or kept under certain unknown conditions. It has been variously regarded as empyreumatic oil, as an acid formed in consequence of a modified process of putrefaction, and as the effect of a fungus, *Sarcina botulina.*

Saussure, Henri de (sō-sür′), a Swiss naturalist; born in Geneva, Switzerland, in 1829. He was a member of the scientific expedition to Mexico, and wrote several memoirs on the insects of that country. He wrote also: "Memoir to Serve for the Natural History of Mexico, the Antilles, and the United States" (1872); "The Genevan Explorers of the Alps" (1879).

Saussure, Horace Benedict de, a Swiss physicist; born in Conches, Switzerland, Feb. 17, 1740; was appointed Professor of Physics and Philosophy in the University of Geneva in 1762. In 1768 he began a tour of the mountain regions of Europe, being the first traveler to ascend to the summit of Mount Blanc. His observations helped to establish the basal facts of geology; and for his investigations he perfected the thermometer, the hygrometer, the endiometer, electrometer and anemometer and invented the cyanometer and diaphanometer. In 1786 he resigned his chair, and in 1798 was appointed Professor of Natural History in the Central School of the department of Leman. His works include: "Voyages in the Alps" (1779–1796); "Hygrometry" (1783); "Water" (1771); etc. He died in Geneva, Jan. 23, 1799.

Saussurea (named after H. B. Saussure and his father, who wrote on agriculture), a genus of *Carlineæ;* herbs, with corymbose purple or violet heads; bracts all unarmed; anthers with a long acute appendage. Known species, about 45. *S. lappa,* called also *Aplotaxis lappa* and *Aucklandia costus,* is believed to be the costus of the ancients and has long been used in Hindu medicine.

Saussurite (after De Saussure, who first found and described it), a variety of zoisite containing soda and found in the vicinity of Lake Geneva. Also the compact to cryptocrystalline felspathic constituent of gabbros, formerly regarded as a variety of Labradorite by some mineralogists, and as oligoclase by others. Lately shown by the microscope not to be a homogeneous mineral, but a mixture of felspars.

Sauterne, a kind of white Bordeaux wine, made from grapes grown in the neighborhood of Sauternes, in the department of Gironde, France.

Sauvagesiaceæ, the *Sauvagesia* family a small order of plants, alliance Violales, by some botanists regarded as a sub-order of Violaceæ, but distinguished by several minor characters. The plants of this order are natives of South America and the West Indies. Their properties have not been investigated. *S. erecta,* the species best known, contains much mucilage, and has been used internally as a diuretic, also externally in diseases of the eye.

Sauvage, Thomas Marie François (sō-väzh′), a French dramatist; born in Paris, France, in 1794. Among his plays are: "The Portfolio; or, the Impromptu Lord" (1820); "Margaret of Anjou" (1826); "The Drunkard" (1830); "A Provincial Conspiracy" (1832); "The Sea Wolf" (1840); "The Amazon" (1846); "The Carnival of Venice" (1860); "My Lord's Coat" (1862). He died in Paris in 1877.

Savage, James, an American historian; born in Boston, Mass., July 13, 1784; was graduated at Harvard University in 1803; studied law and was admitted to the bar; was later a member of both branches of the Massachusetts Legislature. He served as president of the Massachusetts Historical Society for several years. He was the author of "Genealogical Dictionary of the first settlers of New England, showing Three Generations of those who came before May, 1692" (4 vols. 1862–1864) and the editor of Winthrop's "History of New England" (1825–1826); Paley's "Works" (5 vols. 1828); etc. He died in Boston, Mass., March 8, 1873.

Savage, John, an American journalist; born in Dublin, Ireland, Dec. 13, 1828. He settled in New York in 1848, and subsequently in Washington became proprietor of "The States," the organ of Stephen A. Douglas. Included in his popular war songs are "The Starry Flag" and "The Muster of the North." Among his other works are: "Our Living Representative Men" (1860); "Fenian Heroes and Martyrs"; "Poems: Lyrical, Dramatic, and Romantic" (1870); "Picturesque Ireland" (1878–1883); and "Waiting for a Wife," a comedy (1859). He died in Sprague-ville, Pa., Oct. 9, 1888.

Savage, Minot Judson, an American clergyman; born in Norridgewock, Me., June 10, 1841. He was graduated at the Theological Seminary at Bangor, 1864; went to California as a Congregational home

missionary, and preached at San Mateo and at Grass Valley. He removed to Framingham, Mass.; thence was called to Indianapolis, and afterward to Hannibal, Mo. He accepted a call to the Third Unitarian Church in Chicago in 1873, and after a year there was installed pastor of the Church of the Unity, Boston, where he remained for 22 years. After 1896 he was minister in the Church of the Messiah, New York, in association with Dr. Robert Collyer. In his very active career he has published over 30 books on religious, social, and moral questions, among which may be mentioned: "The Religion of Evolution" (1876); "Bluffton" (1878); "Social Problems" (1886); "My Creed" (1887); "Jesus and Modern Life" (1893); "A Man" (1895); "Religion for Today" (1897); "Poems" (1882); "Our Unitarian Gospel"; "Hymns" (1898); "The Minister's Handbook"; "Psychics"; etc.

Savage, Richard Henry, an American novelist; born in Utica, N. Y., June 12, 1846. He wrote: "My Official Wife"; "A Daughter of Judas"; "The Anarchist" "In the Old Chateau"; "The Masked Venus"; "Miss Devereaux of the Mariquita"; and "After Many Years, and Other Poems." He died Oct. 11, 1903.

Savage-Armstrong, George Francis, an Irish poet; born in Dublin in 1845. Among his poetical works are: "Poems, Lyrical and Dramatic" (1879); "Ugone: A Tragedy" (1870); "The Tragedy of Israel," a trilogy (1872–1876); "Stories of Wicklow" (1886); "One in the Infinite" (1891).

Savage Island, a small coral island in the Pacific Ocean, between the Samoan and Tongan islands. It is about 30 miles in circuit and has a population of 5,000 nominal Christians. It was annexed by Great Britain in 1888.

Savanna, or **Savannah,** an extensive open plain or meadow in a tropical region, yielding pasturage in the wet season, and often having a growth of undershrubs. The word is used chiefly in tropical America.

Savannah, a city and county-seat of Chatham co., Ga.; on the Savannah river, 18 miles from its mouth, and on the Central of Georgia, the Florida Central and Peninsular, the Georgia and Alabama, and the Plant System railroads; 90 miles S. W. of Charleston. It is built on a bluff of sand, about 40 feet above low water, and has a water frontage of about 3 miles, the city receding about 2 miles from the river.

Business Interests.— Next to New Orleans, Savannah is the most important commercial city in the South. The largest vessels can enter the harbor, and the river is navigable as far as Augusta. There is regular steamboat communication with Baltimore, Philadelphia, New York, Boston, Liverpool, and the principal Southern cities. It holds the second place in the United States as a cotton emporium, and also exports in large quantities rice, lumber, fertilizers, and naval stores. In the fiscal year ending June 30, 1901, the value of imports aggregated $645,067, exports, $46,738,967. According to the United States census of 1900, there were 155 manufacturing establishments reported, employing $5,716,491 capital, and 2,870 persons; paying $1,176,150 for wages and $3,915,884 for materials; and having a combined output valued at $6,461,816. There are 2 National and several other banks, and a large number of daily and weekly newspapers. The assessed property valuations exceed $37,000,000, and the total bonded debt is about $3,000,000.

Public Interests.— The city has an area of 5 square miles; 98 miles of streets, of which 25 miles are paved; a system of waterworks that cost $1,250,000, with 58 miles of mains; and a sewer system covering 18 miles. The streets are lighted by electricity at a cost exceeding $39,000 per annum; the police department costs annually about $85,000, and the fire department about $72,000. There is a public school enrollment of nearly 9,000 pupils, and annual expenditures for public education of about $120,000. The annual cost of maintaining the city government is about $800,000. The city contains a custom house, court house, Guards' Arsenal, Chatham Academy, Cotton Exchange, Telfair Academy of Arts, a medical college, Convent of St. Vincent de Paul, St. Joseph's Infirmary, Episcopal Orphans' Home, and other charitable institutions.

History.— Savannah was founded in 1733 by General Oglethorpe. In 1776 a British fleet, attempting to take the town, was repulsed after a severe action; and it was taken in 1778, and held in October, 1779, against the combined American and French forces. In the latter action Count Pulaski was killed. Savannah received its city charter in 1789. During the Civil War it was blockaded by the Federal navy, and on Dec. 12, 1864, it was occupied by General Sherman. Pop. (1890) 43,189; (1900) 54,244; (1910) 65,064.

Savannah, a river of the United States, which forms the N. E. boundary of Georgia, and separates it from South Carolina. It is formed by the junction of the Tugaloo and Keowee, 100 miles by the course of the river above Augusta, and is navigable to the city of Savannah for vessels drawing over 18 feet.

Savart's Toothed-Wheel, an apparatus for ascertaining the number or vibrations corresponding to a given note. It consists of an oak frame, with two wheels connected

by a strap. One is toothed, and is made to revolve rapidly by means of a multiplying wheel, with the effect of making a card fixed on the frame to vibrate as each tooth strikes it. An indicator shows the number of revolutions of the wheel, and consequently the number of vibrations in a given time. It is now superseded by the syren.

Savary (sä-vä-rē′), **Anne Jean Marie René, Duc de Rovigo,** a French military officer; born in Marcq, France, April 26, 1774. He entered the army as a volunteer in 1790, served with distinction on the Rhine, in Egypt, and in the battle of Marengo (1800). Napoleon, whose notice he had attracted, made him commander of his bodyguard and employed him in diplomatic affairs for which he showed an admirable capacity. In 1804, as commandant of the troops stationed at Vincennes, he presided at the execution of the Duc d'Enghien, an event which he is believed to have unduly hastened; and in the wars of 1806–1808 he acquired high military reputation at Jena, in the capture of Hameln, and by his victory at Ostrolenka (Feb. 16, 1807). Created Duke of Rovigo in the beginning of the following year, he was sent to Spain by the emperor, and negotiated the perfidious arrangement by which the Spanish king and his son were kidnapped. In 1810 he superseded Fouché as minister of police. After the fall of Napoleon he wished to accompany him to St. Helena; but he was confined by the British government at Malta for some months, and at last made his escape to Smyrna. After experiencing several vicissitudes he returned to Paris in 1819, and was reinstated in his titles and honors. In 1831 he was appointed Commander-in-Chief of the army in Algeria; but ill health forced him to withdraw to France. He wrote his "Memoirs" in 1828. He died in Paris, June 2, 1833.

Save (säv), or **Sau** (sow), a river of Austria. It rises in the Julian Alps; flows S. E. through Carniola, separates Carniola from Styria, flows through Croatia, and after a course of about 540 miles joins the Danube at Belgrade. It is in great part navigable.

Savicu. See SABICU.

Savidge, Eugene Coleman, an American physician; born in Maryland, Oct. 21, 1863; was graduated at the University of France in 1888, and then studied in the University of New York. After traveling extensively he devoted his time to medicine and literature; was gynæcologist at the Roosevelt Hospital, and became a member of the New York Academy of Medicine and several scientific societies. His publications include: "Wallingford" (1882); "Gallery of Eminent Men" (1887); "The Life and Times of Brewster" (1891); "The American in Paris" (1895); etc.

Savigny, Friedrich, Karl von (sä-vēn-yē′), a German jurist; born in Frankfort-on-the-Main, Feb. 21, 1779. He stood long at the head of what is termed the historical school of jurisprudence. His principal works were: "The Legal Right of Property" (1803); "The Present System of Roman Jurisprudence" (1840–1849); "Contract Law"; "History of the System of Roman Law in the Middle Ages"; etc. He died in Berlin, Oct. 25, 1861.

Savile, Sir Henry, an English mathematician; born near Halifax, England, Nov. 30, 1549; entered Brasenose College, Oxford, but in 1561 was elected to a fellowship in Merton College. He traveled on the continent (1578); after his return was Queen Elizabeth's tutor in Greek and mathematics; became Warden of Merton College in 1585, Provost of Eton in 1596; and was knighted in 1604. He founded chairs of geometry and astronomy at Oxford, which still bear his name. He died in Eton, England, Feb. 19, 1622.

Savin, or **Savine,** the *Juniperus sabina*, a bush or low tree, with small, scale-like leaves, and light, bluish-green fruit; a native of Central Europe and parts of Asia. As a drug, savin is an irritant externally and internally, and an emmenagogue. There is an English oil of savin, a tincture of savin, and an ointment of savin.

Savin Oil, a volatile oil obtained by distilling the berries of the savin, *Juniperus sabina*, with water. It is mobile, almost colorless, becomes resinous, yellow, and viscid on exposure to the air, has a sharp aromatic taste and pungent odor. Absolute alcohol dissolves it in all proportions, and forms a clear solution with two parts rectified. Sp. gr.= 0.91–0.94. It is regarded as polymeric with oil of turpentine, $C_{10}H_{16}$. The fresh berries yield 10 per cent. of oil.

Savonarola, Girolamo, an Italian reformer; born of a noble family in Ferrara, Sept. 21, 1452. He was educated at home, and at a very early age became deeply versed in the philosophy of the schools; but his disposition was from the first tinged with religious asceticism, and in 1474 he formally withdrew from secular affairs and entered the Dominican Order at Bologna.

GIROLAMO SAVONAROLA.

Having completed his novitiate and the studies of the order, he seems to have made

his first public appearance as a preacher in 1482, at Florence, where he had entered the celebrated convent of his order, San Marco, and where he preached the Lent in that year. His first trial, however, was a failure; his voice was harsh and unmusical, and his simple, devout earnestness failed to interest his hearers, so that, after a time, the course of lectures was entirely deserted. Some time afterward Savonarola was sent to a convent in Brescia, where his zeal began to attract notice, and the disadvantages of manner and address ceased to be felt under the influence of his sterling genius and irresistible enthusiasm. In 1489 he was once more recalled to the convent of San Marco in Florence.

His second appearance in the pulpit of San Marco was a complete success. The great subject of his declamation was the sinfulness and apostasy of the time; and in his denunciation of the vices and crimes of his age he took as his theme what has been the topic of enthusiasts in almost every age, the mystical visions of the Apocalypse. These he applied with terrible directness to the actual evils with which, as with a moral deluge, the age was inundated; and for his half-expositions, half-prophetical outpourings his followers claimed for him the character of an inspired prophet. Under the rule of the great head of the Medici family, Lorenzo the Magnificent, art, literature, and philosophy had all followed the common direction of that elegant but semi-pagan revival which the scholars of the 15th century had inaugurated; and the whole spirit of the social as well as intellectual movement of which Florence, under the Medici, was the center was utterly at variance with the lofty Christian spirituality and severe asceticism in which Savonarola placed the very first conditions of the restoration of true religion and morality. His preaching, therefore, in its spirit, as well as in its direct allusions, was no less antagonistic to the established system of the government than to the worldly and irreligious manners of the age; the visions and predictions ascribed to him had quite as much of political applicability as of religious significance; and thus, to the aristocratic adherents of the Medici, Savonarola early became an object of suspicion, if not antipathy and dread. It is said by Pico de Mirandola that he refused to grant absolution to Lorenzo when the latter lay dying in 1492 as the Magnificent declined to accede to the demands made by his confessor.

Up to this time, however, Savonarola's relations with the Church were, if not of harmony, at least not of antagonism; and when, in the year 1493, a reform of the Dominican Order in Tuscany was proposed under his auspices, it was approved by the Pope, and Savonarola was named the first vicar-general. About this date, however, his preaching had assumed a directly political character, and the predictions and denunciations which formed the staple of many of his discourses pointed plainly to a political revolution in Florence and in Italy as the divinely ordained means for the regeneration of religion and morality. In one of his discourses he pointed plainly to the advent of the French under Charles VIII.; and when this prediction was fulfilled by the triumphant appearance of the French expedition, Savonarola was one of a deputation of Florentines sent to welcome Charles VIII. as the savior of Italy, and to invite him to Florence. Very soon, however, the French were compelled to leave Florence, and a republic was established, of which Savonarola became, though without political functions, the guiding and animating spirit, his party, who were popularly called *Piagnoni*, or "Weepers," from the penitential character which they professed, being completely in the ascendant.

It was during this brief tenure of influence that Savonarola displayed to the fullest extent both the extraordinary powers of his genius and the full extravagance of the theories to which his enthusiastic asceticism impelled him. The republic of Florence was to be the model of a Christian commonwealth, of which God Himself was the chief ruler, and His Gospel the sovereign law; and thus the most stringent enactments were made for the repression of vice, and of all the sinful follies by which it is fomented and maintained. All the haunts of debauchery were suppressed; gambling in all its forms was prohibited; the vanities of dress were restrained by sumptuary enactments; and, under the impulse of the popular enthusiasm which the enthusiasm of the prophet engendered, women flocked in troops to the public square to fling down their costliest ornaments, and his followers made in the piazza an immense "bonfire of vanities," destroying in one hecatomb large numbers of cards, dice, masks, carnival costumes, and probably some books of licentious poetry and indecent pictures. There seems no ground for the charge often made that he and his disciples destroyed in indiscriminating zeal valuable statues and rare manuscripts.

Meanwhile, the extremes of his rigorism; the violence of his denunciations, which did not spare even the Pope himself (Alexander VI.); the assumption by him, or attribution to him, of a supernatural gift of prophecy; and the extravagant interpretation of the Scriptures, and especially of the Apocalypse, by which he sought to maintain his views, drew on him the displeasure of Rome. He was cited, in the year 1495, to answer a charge of heresy at Rome; and, on his failing to appear, he was forbidden to preach;

the brief by which the Florentine branch of his order had been made independent was revoked; he was offered a cardinal's hat on condition of his changing his style of preaching — an offer he indignantly refused; and he was again forbidden to preach. Once again Savonarola disregarded this order. But his difficulties at home now began to deepen. The measures of the new republic proved impracticable. The party of the Medici, called "Arrabbiati" ("Enraged"), began to recover ground. A conspiracy for the recall of the exiled house was formed; and though, for the time, it failed of success, and five of the conspirators were condemned and executed, yet this very rigor served to hasten the reaction. The execution of these conspirators was afterward laid to the charge of Savonarola, who was said to have been the chief opponent of the proposal to grant them an appeal — a charge for which there seems to be no foundation.

All circumstances seemed now to count against the once all-powerful Savonarola. At the critical point of the struggle of parties came, in 1497, a sentence of excommunication from Rome against Savonarola. Savonarola openly declared the censure invalid, because unjust, and refused to hold himself bound by it. During the plague Savonarola, precluded by the excommunication from administering the sacred offices, devoted himself zealously to ministering to the sick monks. A second "bonfire of vanities" in 1498 led to riots. In the same year, when the new elections took place, the party opposed to Savonarola, the Arrabbiati, came into power. He was ordered to desist from preaching; and the struggle was brought to a crisis by the counterdenunciations of a preacher of the Franciscan order, long an antagonist of Savonarola, Francesco da Puglia. In the excited state of the popular mind thus produced an appeal was made by both of the contending parties to the interposition of divine providence by the ordeal of fire; and one of Savonarola's disciples agreed to make trial of the dread ordeal along with a Franciscan friar. But at the moment when the trial was to have come off (April, 1498) difficulties and debates arose, and nothing was actually done. The result of this was to destroy with the populace the prestige of Savonarola's reputation, and to produce a complete revulsion of public feeling.

In the midst of this reaction he was cited before the council, and brought to trial for falsely claiming to have seen visions and uttered real prophecies, for other religious errors, and for political insubordination. He denied the charges; but, put to the torture, he made avowals which he afterward withdrew. The conclusion was a foregone one; he was declared guilty of heresy and of seditious teaching, and of being an enemy to the peace of the Church. The acts of the trial were sent to Rome, where the sentence was confirmed; he, with two disciples of his order, was given up to the secular power; so on May 23, 1498, this extraordinary man and his two companions, brothers Domenico and Silvestro, were strangled, and their bodies burned by the executioner. They died professing their adherence to the Catholic Church, confessed and received absolution, and on the morning of the execution Savonarola administered the last communion to his two companions and himself. There seems no doubt that Savonarola firmly believed in the dogmas of the Roman Catholic Church; and it is only as a moral and religious reformer, and not a theological teacher, that he can in any way be regarded as a forerunner of the Reformation of the 16th century.

Savoy (sa-voi'), a former duchy of the kingdom of Sardinia, now annexed to France, and forming the departments of Savoie and Haute-Savoie, having N. and N. E. Switzerland, S. E. and S. Piedmont, and W. the departments of Isère and Ain; area, 4,270 square miles. It is the most elevated country of Europe, consisting principally of mountains, the most elevated of which is Mount Blanc. The valleys and low grounds are fertile and well cultivated. Rivers, Rhône, Arve, Drance, and Isère; lakes, Annecy and Bourget. Products, wheat, oats, barley, rye, and hemp. Minerals, iron, copper, silver, lead, coal, and salt. Manufactures, cotton and woolen fabrics, hosiery, felt hats, glass, earthenware, etc. Capital of Savoie, Chambery; of Haute-Savoie, Annecy. Savoy was anciently a part of Sapaudia, whence the name Saboia, or Savoy, is derived. It was erected into a duchy under Amadeus VIII., in 1416, and was ceded to France in 1860. Pop. (1901) 518,584.

Savoy, House of, one of the most ancient royal families, and also distinguished for having produced more great warriors and politicians than any other royal house of Europe. Its origin is not historically established, but most genealogists trace it to a German count, Berthold, who, in the 11th century, established himself on the W. slope of the Alps between Mont Blanc and Lake Leman. In 1111 his descendants were enrolled among the counts of the Holy Roman empire. Count Amadeus, in 1383, founded a law of primogeniture which greatly strengthened the family, leading to the immediate acquisition of the territory of Nice. In 1416 the Counts of Savoy adopted the title of duke; and in 1418 they acquired the principality of Piedmont. Taking part in the great wars between France and the Holy Roman empire, now on the

one side and then on the other, as policy dictated, the Princes of Savoy increased their possessions in all directions, but chiefly toward the S.; and at the peace of Utrecht in 1713 they obtained the island of Sicily, with the title of king. Sicily had to be exchanged, in 1720, for the isle of Sardinia, to which henceforth the royal dignity remained attached. Genoa and the surrounding territory were added to the Sardinian crown at the peace of 1815. The direct male line of the house of Savoy died out with King Charles Felix, in 1831, and the existing Salic law prohibiting the accession of females, the crown fell to Prince Charles Albert, of the House of Savoy-Carignan. The latter branch — taking its name from a small town in the province of Turin — was founded by Thomas Francis, born in 1596, a younger son of Duke Charles Emanuel I. of Savoy. King Charles Albert, the first of the house of Savoy-Carignan, abdicated the throne, March 23, 1849, in favor of his son, Victor Emanuel II., the first King of Italy. See VICTOR EMANUEL.

Savoy, The, a district of London, between the Strand and the Thames Embankment, site of the Savoy Palace, built by Peter of Savoy, uncle of Eleanor, queen of Henry III., in 1245. It was burned by Wat Tyler in 1381, but restored as the Hospital of St. John by Henry VII. in 1505. The hospital was dissolved in 1702, and the buildings removed in 1817–1819. The Chapel of the Savoy, which at one time enjoyed the privilege of sanctuary, was greatly injured by fire in 1864, and was restored at the expense of Queen Victoria. It is one of the chapels-royal, but is used as a district church.

Savoy Conference, in Church history, the name given to the meetings of the Commissioners for the Revision of the Liturgy in the reign of Charles II. Twelve bishops took part in the proceedings on behalf of the Establishment, while the Nonconformists were represented by Baxter, Calamy, Reynolds, and others of their leaders. The first meeting took place on April 15, 1661, and the Commission sat for four months.

Savu, Savou, or **Savoe,** an island of the Malay Archipelago S. W. of Timor; area, 237 square miles. It yields millet, maize, sugar cane, cotton, tobacco, etc., and its Malayan inhabitants are subject to the Dutch government of Timor. Pop. 35,000.

Saw, an instrument with a serrated or dentated blade, the teeth of which rasp or cut away wood or other material, making a groove known as a kerf. The Greeks claim the invention of the saw, but it occurs on the Egyptian monuments. Saws of the bronze age have been found in Germany and Denmark; and in the stone age rude saws of flint were affixed to wooden handles by bitumen. The Caribs formerly employed saws of notched shells, and the Tahitians of sharks' teeth.

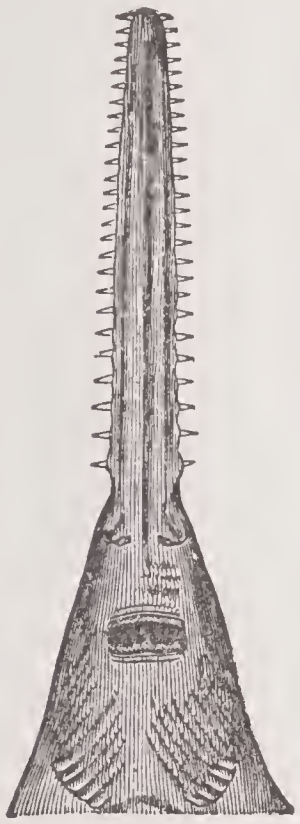
The best saws are of tempered steel, ground bright and smooth; those of iron are hammer-hardened; hence the first, besides being stiffer, are likewise found smoother than the last. The edge in which are the teeth is usually thinner than the back, because the back is to follow the edge. The teeth are cut and sharpened with a triangular file, the blade of the saw being first fixed in a whetting-block. Saws are used to cut wood, stone, ivory, and other materials, and are either reciprocating or circular, and of various sizes and forms, according to the purpose for which each is intended. They may be divided into hand saws and machine saws, of which the first are the more numerous. Of hand saws the most commonly used are the band saw, the crosscut saw, the frame saw, the hand saw, the panel saw, the keyhole saw, the bow saw, the ripping saw, the sash saw, the tenon saw, etc. Machine saws are divided into circular, reciprocating, and band saws. The circular saw is a disk of steel with teeth on its periphery; it is made to revolve at great speed, while the material to be cut is pushed forward against it by means of a traveling platform. The reciprocating saw works like a two-handled hand saw, but it is fixed and the material pushed forward against its teeth. The ribbon saw consists of a thin endless saw placed over two wheels, and strained on them. It passes down through a flat sawing table, upon which the material to be cut is laid.

Saw-bill, a family of birds, *Trinitiæ,* order *Insessores,* comprising birds with the bill as long as the head, gently decurved near the tip, but not hooked, and the cutting edges dentated; the tarsi rather long, feet large, the middle and outer toes connected for more than half their length. This family is represented in North America by *Monotus cæruliceps,* the saw-bill of Mexico.

Sawdust, the accumulated particles caused by sawing wood, stone, etc. Besides the more common uses of sawdust, it is commercially valuable as the basis of various manufactures. Oxalic acid is manufactured on a large scale from wood sawdust. The process consists in first fusing sawdust with a mixture of the hydrates of potassium and sodium in iron pans. The gray or brown powder thus obtained is then treated with water, which leaves the sodium oxalate undissolved. This salt is boiled with milk of lime, the resulting calcium oxalate being then decomposed with sulphuric acid and the filtrate evaporated to yield crystals of oxalic acid. Sawdust is also used in the "carbonating" stage of the process for the manufacture of soda

ash. The substance called *bois-durci* (hardened wood), of which beautiful ebony-like medallions and other ornaments are made, consists of the fine sawdust of rosewood, ebony, and other woods formed into a paste with blood and pressed into molds or dies. The sawdust of mahogany and rosewood is used in dressing furs, and the small fragments of some woods, such as the pencil cedar, made by saw cuts or the turning tool, yield perfumes. Sawdust sinks in water, though the wood from which it is cut floats.

Sawfish, a popular name for any species of the genus *Pristis*, from the saw-like weapon into which the snout is produced.



HEAD OF SAWFISH FROM BELOW.

They are common in tropical and less so in subtropical seas, and attain a considerable size, specimens with a saw six feet long and a foot broad at the base being far from rare. Their offensive weapon renders them dangerous to almost all other large inhabitants of the ocean. It consists of three or five (rarely four) hollow cylindrical tubes (the rostral processes of the cranial cartilage) placed side by side, tapering toward the end and covered with a bony deposit, in which the teeth of the saw are implanted on each side. The real teeth are far too small to inflict a serious wound or to seize other animals, so that the sawfish use their rostral weapon in tearing off pieces of flesh from their prey or in ripping open the abdomen, when they seize and devour the detached portions or the protruding soft parts.

Sawflies, a group of insects belonging to the order *Hymenoptera* and distinguished by the peculiar conformation of the ovipositor of the females, which is composed of two broad plates, with serrated or toothed edges, by means of which they incise the stems and leaves of plants, and deposit their eggs in the slits thus formed. The turnip fly, *Athalia centifolia*, and the gooseberry fly, *Nematus grossulariæ*, are examples.

Sawmill, a mill for sawing timber. It may be driven either by steam or water. The saws used are either circular or reciprocating. The larger mills in America are furnished with gang-saws, the saw frame being filled with saws set at any distance from each other that may be desired. When the log has been squared by a circular saw it is transferred to the gang and cut into deals or boards at a single passage. Sawmills were erected at Augsburg in 1322, in Madeira in 1420, at Breslau in 1427, in Norway about 1530, and at Lyons in or before 1555. In 1663 a Dutchman attempted to set one up near London, England, but was prevented by the populace. No other attempt was made till 1767 or 1768, when a sawmill was built at Limehouse, but was pulled down by rioters. The government made good the damage, and a new one erected was well protected and stood.

TURNIP SAWFLY.

Saw-set, a tool or implement to slant the teeth laterally from the plane of the saw, alternately to the right and left, in order that the kerf may be wider than the thickness of the blade, and friction be reduced. In some cases, the edge of the tooth is spread to widen its cut, instead of bending it laterally.

Sawwort, the common name for *Serratula*, a genus of plants, order *Asteraceæ*, having the habit and qualities of the thistle, and called from having leaves edged with cutting teeth.

Sawyer, Charles Henry, an American manufacturer; born in Watertown, N. Y., March 30, 1840; settled with parents in Dover, N. H., in 1850; received an academic education and engaged in the woolen business; was superintendent of the Sawyer Woolen Mills in 1865–1881, and president of the same in 1881–1898. He held a seat in the New Hampshire Legislature in 1869–1870 and in 1876-1877; was Republican governor of that State in 1887-1889; then became the New Hampshire commissioner to the Paris Exposition. He died Jan. 18, 1908.

Sawyer, Leicester Ambrose, an American author; born in Pinckney, N. Y., July 28, 1807. He was pastor of various churches (1842–1859), and published: "Elements of Biblical Interpretation" (1836); "Mental Philosophy" (1839); "Moral Philoso-

phy" (1845); "Organic Christianity" (1854); "Reconstruction of Bible Theories" (1862); and "Final Theology; or Introduction to the New Testament" (vol. i. 1879). He also published a translation of the New Testament, without the usual division into verses. He died in 1898.

Sawyer, Sylvanus, an American inventor; born in Templeton, Mass., April 15, 1822; early turned his attention to invention. In 1843 he patented a machine for preparing chair-cane from rattan; brought about many improvements in rifled cannon projectiles in 1853–1855; took out patents on dividers and calipers in 1867; invented a steam generator in 1868; obtained a patent for a sole-sewing machine in 1876, and for a watchmaker's lathe in 1882. He died in Templeton, Mass., Oct. 28, 1895.

Saxe, Maurice, Comte de, a French military officer; a natural son of Augustus II., King of Poland; born in Goslar, Prussia, Oct. 28, 1696. He entered the army at an early age, and was present with Prince Eugene at the siege of Belgrade. In 1720 he went to Paris. After an unsuccessful attempt to get himself elected Duke of Courland he took service in the French army, distinguished himself in the campaign of 1733–1735, and was made lieutenant-general. In the general war which followed the death of the Emperor Charles VI., Saxe took a distinguished part. He captured Prague, defended Alsace, and in 1743 was named Marshal of France. In the following year he held a command in Flanders. One of his most brilliant achievements was his victory over the English and Hanoverian forces at Fontenoy in May, 1745. He was at the time "nearly dead of dropsy; could not sit on horseback, except for a few minutes; was carried about in a wicker bed; had a lead bullet in his mouth all day, to mitigate the intolerable thirst." (Carlyle.) The victories of Roucoux and Laufeldt, and the capture of Maestricht, added to his fame in two following years. Saxe was a man of great size and strength, intrepid, self-possessed, and as a commander won fame for his ingenuity and dash; but he was one of the most dissolute men of his age. George Sand, the eminent author, was descended from an illegitimate daughter of his. He wrote a work on the art of war, called "My Dreams." He died in his palace of Chambord, near Blois, France, Nov. 21, 1750.

Saxe, John Godfrey, an American humorous poet; born in Highgate, Vt., June 2, 1816. In 1872 he became editorially connected with the Albany "Evening Journal," and subsequently contributed to "Harper's Magazine" and the "Atlantic Monthly." He was also well known as a lecturer. His most popular verses include "Rhyme of the Rail" and "The Proud Miss McBride"; and his published works: "The Money King" (1859); "The Flying Dutchman; or, The Wrath of Herr von Stoppelnose" (1862); "The Masquerade and Other Poems" (1866); "Fables and Legends in Rhyme" (1872); and "Leisure-Day Rhymes" (1875). He died in Albany, N. Y., March 31, 1887.

Saxe-Altenburg, Duchy of (saks-al'-tuhn-burg); a State of the German empire; divided into two nearly equal portions by a part of Reuss, and bounded on the S. W. by the grand-duchy of Saxe-Weimar-Eisenach, on the N. by Prussia, and on the E. by Saxony; area, 511 square miles. The Eastern or Altenburg division is very fertile, while the Western or Saal-Eisenburg portion is hilly and wooded. The duchy is represented by one vote in the Bundesrath and one vote in the Reichstag of the German empire. The capital is Altenburg. Pop. (1905) 38,818. Pop. of duchy (1905), 206,508.

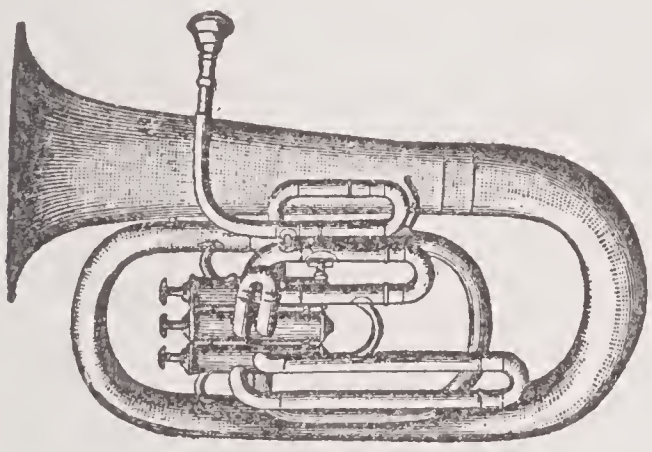
Saxe-Coburg-Gotha, Duchy of (săks'-kō-burg-gō-ta), a State of the German empire, comprising the province of Gotha, lying between Prussia, Schwarzburg, Meiningen, and Weimar; and the province of Coburg, lying between Meiningen and Bavaria; Coburg 218 square miles, and Gotha 542 square miles. The S. of Gotha and the N. of Coburg are both mountainous. Both divisions are fertile; the hills are covered with wood, and in Gotha coal and other minerals are found. The chief occupations of the inhabitants, particularly in Coburg, are cattle rearing and agriculture. In Gotha there are manufactures of linen, leather, metal-wares, etc. The government is a constitutional monarchy, and each province has its own elective assembly. For affairs common to both divisions the assemblies meet conjointly at Coburg and at Gotha alternately, the two chief towns of the duchy. The ducal house and the greater part of the population profess the Lutheran faith. The late Prince Consort was the younger brother of Duke Ernest II., and Prince Alfred of Great Britain, Duke of Edinburgh succeeded his uncle in 1893, dying in 1900, without a son. The present heir is the Duke of Albany, son of Prince Leopold and nephew of King Edward VII. of England. Pop. (1905) 242,432.

Saxe-Meiningen, Duchy of (săks-mī'-ning-ĕn), a State of the German empire, consisting of a main body and several minor isolated portions; area, 953 square miles. The greater part of the surface is hilly, and the principal crops are oats, buckwheat, potatoes, turnips, hemp, and the pastures rear considerable numbers of cattle, sheep, and horses. The minerals include iron and copper, worked to a small extent, and the manufactures are chiefly ironware, porcelain, glass, etc. The government is a heredi-

tary and constitutional monarchy, there is a representative chamber of 24 members, and the great majority of the inhabitants are Lutherans. The capital is Meiningen. Pop. (1905) 268,916.

Saxe-Weimar, Grand-Duchy of, or **Saxe-Weimar-Eisenach** (saks-wī'mar-īs-näch), a State of the German empire, consisting of three larger portions, Weimar, Neustadt, and Eisenach, and 24 smaller exclaves; area, of the whole, 1,397 square miles. The forests are very extensive, and form the principal wealth of the grand-duchy. The minerals are unimportant. In Eisenach woolen, cotton, and linen tissues, ribbons, and carpets, etc., are made. The chief town is Weimar, and there is a university at Jena. The government is constitutional, the legislative power being vested in a house of Parliament, consisting of one chamber of 31 members. Pop. (1905) 388,095.

Saxhorn, a brass instrument, invented by A. A. J. Sax, constructed in such a manner that the large portion, after passing under the arm of the performer, repasses over his shoulder, presenting the bell to the front. The advantage of this shape is that it avoids the elbows, which would otherwise impair the progress of the sound. Saxhorns have great powers, more especially the contra bassos in E and B flat; the latter of which has 48 feet of development in its tube.



SAXHORN.

Saxicava, a genus of *Gastrochænidæ,* with numerous species, ranging from low water to 140 fathoms. It is found in the Arctic seas, where it attains its largest size, in the Mediterranean, at the Canaries, and in Cape Colony. The young shell is symmetrical, with two teeth in each valve; the adult is rugose, toothless, thick, oblong, gaping, with an external hinge ligament; siphons large, and united near the end. This mollusk is so variable under different conditions and at different ages that five genera and 15 species have been founded on its aberrant forms. It bores into stone, and has done great damage to submarine masonry.

Saxicola, in ornithology, the stonechat; the typical genus of *Saxicolinæ.* Beak straight, slender, surrounded with a few bristles; nostrils basal, lateral, oval half closed by a membrane. Three toes in front, one behind. Habitat, Africa, Northwest India, the Palæarctic region, migrating to Alaska and Greenland.

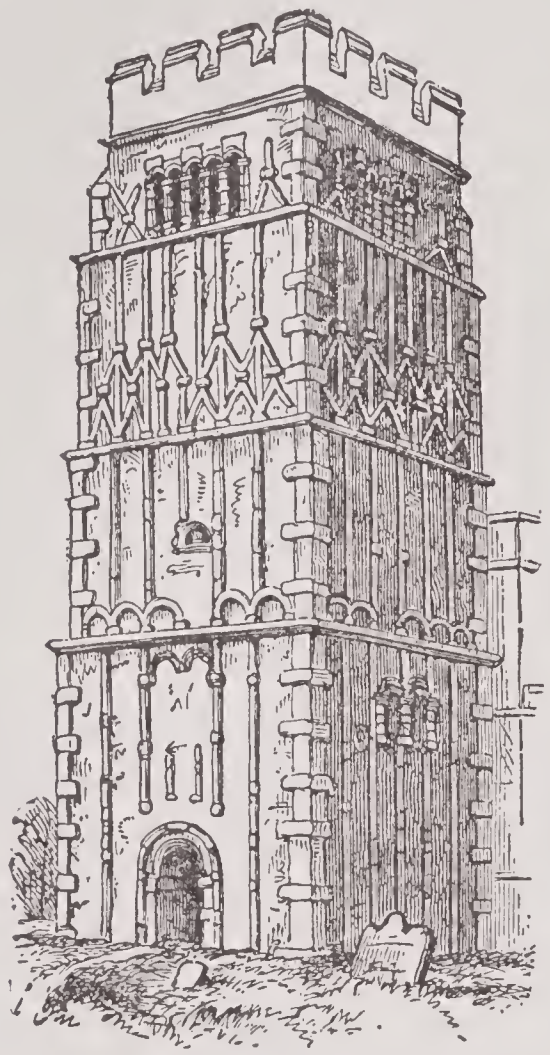
Saxicolinæ, stonechats; a family of *Sylviidæ,* with 12 genera and 126 species, absent from America (except the extreme N. W.), abundant in the Oriental region, moderately so in the Palæarctic, Ethiopian, and Australian. Bill depressed at base; gape with diverging bristles; feet lengthened, tail rather short; head large.

Saxifraga, in botany, saxifrage, the typical genus of *Saxifragaceæ.* Calyx in five segments; petals five; stamens 10 or 5; ovary two-celled; capsule with two beaks, two-celled, many seeded. Perennial plants, rarely herbs, with white or yellow, or rarely red or purple, cymose inflorescence. Known species, 160. Not found in Australia, South Africa, or the South Sea Islands; distributed in most other regions.

Saxifragaceæ, or **Saxifrageæ,** in botany, saxifrages; the typical order of the alliance Saxifragales, herbs often growing in patches; leaves alternate, flower-stems simple, often naked; sepals four or five, petals five or none, inserted between the lobes of the calyx; stamens 5 to 10, a disk generally present; stigmas sessile on the top of the ovary; ovary inferior or nearly superior, usually of two carpels cohering below and diverging near the apex, sometimes two-celled, with a central placenta, or one-celled with a double one, fruit generally membranous or a two-celled capsule, with numerous very minute seeds. Known genera 19, species 310. (Lindley.) Genera 19, species 250, including the Ribesieæ. (Sir Joseph Hooker.) Most of the species are from the North Temperate and Arctic zones.

Saxon Architecture, the style of architecture in use in England from the time of its conversion till the Conquest. It is easily recognized by its massive columns and semicircular arches, which usually spring from capitals without the intervention of the entablature. In the first Saxon buildings the moldings were extremely simple, the greater part consisting of fillets and platbands at right angles to each other, and to the general surface. The walls are of rough masonry, very thick, and without buttresses; the towers and pillars thick in proportion to height; the quoins are of hewn stone set alternately on end and horizontally; the arches of the doorways and windows are rounded or with triangular heads; window openings in the walls are splayed upon the interior and exterior, the window being in the middle of the thickness of the wall, and divided with a baluster of

peeuliar shape, especially in the belfries. In the earlier part of the Saxon period most of the domestie edifices built were of wood or mud with thatehed roofs. In plan they were very rude. The fire was kindled in the



SAXON ARCHITECTURE: TOWER OF EARL'S BARTON, NORTHAMPTONSHIRE, ENGLAND.

eenter of the hall, and, as there were no chimneys, the smoke made its way out through louvers or by the doors or windows.

Saxon Blue, a solution of indigo in concentrated sulphuric acid — it is much used as a dyestuff.

Saxon Green, a color obtained by dyeing with yellow upon a ground of Saxon blue.

Saxons, a Germanie people, whose name is usually derived from an old Teutonie word *sahs,* meaning "knife," though some authorities believe it to be another form of *Sassen* = "the settled people," are first mentioned by Ptolemy as dwelling in the S. of the Cimbrian Peninsula. In the 3d century a "Saxon League" or "Confederation," to which belonged the Cherusci, the Angrivarii, the Chauci, and other tribes, was established on both sides of the estuary of the Elbe and on the islands off the adjacent coast. During the reigns of the Emperors Julian and Valentinian they invaded the Roman territory; but their piratical descents on the coasts of Britain and Gaul are far more famous. In 287 Carausius, a Belgie admiral in the Roman service, made himself "Augustus" in Britain by their help; and about 450 they in eonjunetion with the Angles established themselves permanently in the island and founded the Anglo-Saxon kingdoms. Before the 5th century they had settled along the North Sea eoasts from the Elbe to the Loire, a part of what was later Flanders being ealled the "Saxon shore." But these Saxon settlements soon became absorbed in the kingdom of the Franks. In Great Britain too there was a Saxon shore with its count. In Roman times the eoast districts of Great Britain from Brighton N. to the Wash were ealled Litus Saxonicum, or Saxon shore. These localities were particularly exposed to the attacks of the Saxons from aeross the North Sea, and were placed under the authority of a speeial officer, the Count of the Saxon Shore.

At home the Old Saxons enlarged their territory by eonquest till it embraced all the lands between the Rhine and Elbe, the North Sea and the Harz Mountains. Along with the Franks they destroyed the kingdom of the Thuringians in 531, and obtained possession of the land between the Harz and the river Unstrut; but this region too was forced to acknowledge the Frankish sovereignty. But the Saxons having thrown off the yoke, wars between the Saxons and the Franks were constant after 719; and the latter after 772 were, under the vigorous leadership of Charlemagne, generally successful, in spite of the determined opposition offered by Wittekind (or Widukind). The desperate resistance of the Saxons was not finally broken till 804, though Wittekind submitted in 785. After the final submission the conquered people accepted Christianity, having before defended their heathen faith in conjunction with their freedom. By the treaty of Verdun (843) the Saxon districts fell to Austrasia, the nueleus of the German empire. The "Saxons" of Transylvania are not all of pure Saxon descent; the name is used rather as synonymous with "German." To the Celtic Britons the English or Anglo-Saxon invaders were known only as Saxons, and *Sassenach,* or other Celtie form of the word Saxon, is still the name for Englishmen and their language alike in Wales, the Scottish Highlands, and Ireland.

Saxon Siberia, a portion of the mountain district of the Erz-Gebirge, in Saxony; so named on aecount of the severity of its climate in winter.

Saxon Switzerland, a name given to part of the kingdom of Saxony, on the Elbe, S. E. of Dresden and bordering on Bohemia. It consists of a group of mountains of sandstone, with valleys and streams of the most picturesque eharaeter, in which isolated

masses of sandstone, large and small, occur in very fantastic shapes. It is about 24 miles long and equally wide.

Saxony, Kingdom of, a State of the German empire; bounded on the N. W., N. and E. by Prussia; S. E. and S. by Bohemia; S. W. by Bavaria; and W. by Reuss, Saxe-Weimar, and Saxe-Altenburg; greatest length, 135 miles; greatest breadth, 75 miles; area, 5,787 square miles. For administrative purposes it is divided into the five districts of Dresden, Leipsic, Zwickau, Chemnitz, and Bautzen. Pop. (1905) 4,508,601.

General Features.— With the exeeption of a very small portion of the E., whieh sends its waters to the Baltic, Saxony belongs to the basin of the Elbe, which traverses it in a N. W. direction for about 70 miles. Of its tributaries the most important are the Mulde and the Elster. The surfaee, though very mueh broken, may be regarded as an inelined plane, which commences in the S., in the Erzegebirge ehain, and slopes toward the N. In the more elevated districts, the scenery is wild, and on either side of the Elbe, from the Bohemian frontier to Pirna, is a remarkable traet, which has received the name of the Saxon Switzerland. On the Prussian frontiers, where the district subsides to its lowest point, the height above the sea is only 250 feet. The loftiest summits are generally composed of granite and gneiss, and are rich in mineral products. The Erzgebirge is eontinued by the Riesengebirge, a branch of which, under the name of the Lausitzergebirge, or Mountains of Lusatia, covers a considerable portion of East Saxony. The climate in the loftier mountain districts is very eold, but with this exeeption it is milder than that of most eountries of Europe under the same latitude.

Productions, Industries.— The most important erops are rye, oats, barley, wheat, potatoes; and orchard fruits, particularly apples, pears, and plums, are very abundant. Considerable attention is paid to the eulture of the vine. Large numbers of horned cattle are exported. The wool of Saxony has long been celebrated for its excellence. Swine and horses are of a superior breed. The minerals are of great importance and include silver, lead, tin, iron, cobalt, nickel, bismuth, and arsenic. Lignite and eoal are found in various districts, there being (1897) 141 mines in operation. The quarries furnish in abundance granite, porphyry, basalt, marble, serpentine, and sandstone. Several mineral springs of reputation exist. Saxony is an important manufacturing country, textile fabrics, such as cotton and woolen goods, linen, laee and ribbons, being the leading products. Other industries are earthenware, Dresden ware, leather, straw weaving, chemieals, etc., and the printing establishments of Leipsic are well known.

Saxony is connected with the great trunk lines which traverse Central Europe, and in 1905 had 2,020 miles of railway, almost entirely under state control.

Administration, etc.— The government is a constitutional monarchy (forming part of the German empire), in which the executive power is lodged in the crown and in the Ministers of State, of Justice, of Finance, of Interior, of War, etc.; and the legislative power jointly in the crown and two chambers. Justice is administered by three classes of courts, namely, courts of primary, secondary, and tertiary resort or instance. In religion universal toleration is guaranteed; but the religious body recognized by the State is the Lutheran Church. At the head of the educational establishments of the kingdom is the University of Leipsic, there are gymnasia in the principal towns, and a large number of industrial, commercial, agrieultural, musical and art institutes. The army is raised ehiefly by eonscription — all male eitizens being bound to serve for three years in the active service, four years in the reserve, and five in the Landwehr. The chief towns are Dresden (the capital), Leipsic, Chemnitz, Zwickau, Plauen, and Freiberg.

History.— The present ruling family in Saxony elaims deseent from Wittikind, the national hero who was conquered by Charlemagne and embraced Christianity. The territory became a duchy about 880, and in the 10th eentury Duke Henry was elected German emperor. In 1127 the duchy passed to the Bavarian branch of the Guelph family, and after several changes Frederick the Warrior, Margrave of Meissen and Landgrave of Thuringia, became (1423) Elector of Saxony. His grandsons, Ernest and Albert, in 1485 divided the family possessions, founding the Ernestine and Albertine lines respectively, the former retaining the electoral dignity. Ernest was succeeded by his sons Frederick III. (1486–1525) and John (1525–1532), but in 1548 the eleetor of the Ernestine line was put under the ban of the empire, and the electorate transferred to Maurice, who represented the Albertine line which now occupies the throne. Maurice was succeeded by his brother Augustus (1553–1586), who made important additions to the Saxon territories by purchase and otherwise. His son, Christian I., died in 1691, leaving his erown to his son, Christian II. Christian's brother and successor, John George I. (1611–1656), joined Gustavus Adolphus in the Thirty Years' War, and the Saxon forces took part at Breitenfeld and at Lützen. Frederick Augustus I. (1694–1733) embraced the Catholie religion (1697) to obtain the crown of Poland. Frederick Augustus II. also obtained the Polish erown (as Augustus III.) after a war with France and joined with Austria in the Seven Years'

war. Frederick Augustus III. (1763–1827) reluctantly took part against France when war was declared by the Imperial Diet in 1793, but after the battle of Jena the elector and his army fought side by side with the French. Napoleon conferred on him the title of king, and large additions were made to the Saxon territory in 1807 and 1809. In 1813 Saxony was the scene of Napoleon's struggle with the allies, and the battles of Lützen, Bautzen, Dresden, and Leipsic were followed by the Congress of Vienna (1814), when a large part of the dominions then under the Saxon monarch was ceded to Prussia. A period of great progress followed, interrupted somewhat at the revolutionary period of 1848–1849. In the Austro-Prussian war of 1866, Saxony took part with Austria and was occupied by the Prussian troops. Prussia desired to incorporate the kingdom, but Austria, supported by France, opposed this arrangement, and Saxony was admitted into the North German Confederation instead. In the Franco-Prussian War, Saxony united with the rest of Germany against France; and the present King Albert (then crown prince) was commander of the German army of the Meuse.

Saxony, Prussian, a province of the Prussian monarchy, of irregular shape, and with isolated districts, almost in the center of Germany, N. of the kingdom of Saxony; area, 9,750 square miles. Originally a part of Saxony, it was given to Prussia by the Congress of Vienna (1814). The N. and larger portion belongs to the North German plain; the S. and S. W. is elevated or hilly, partly belonging to the Harz Mountain system, and containing the Brocken (3,742 feet). The chief river is the Elbe. The soil is generally productive, about 61 per cent. being under the plough and 20 per cent. forests. Beet sugar is largely produced. The mineral products are valuable, particularly lignite, salt, kainite, and other potash salts. The capital of the province is Magdeburg; other towns are Halle (with a university), Erfurt, and Halberstadt. Pop. (1905) 2,979,221.

Saxophone, the name of a family of musical instruments invented by M. Sax (see SAXHORN). They consist of a conical brass tube, sounded by a mouthpiece furnished with a single reed similar to that of the clarinet, and are made in as many different keys as the saxhorn. The contralto and baritone are mostly used in Great Britain; but in France all the varieties are more or less used. They have 20 holes covered by keys and studs for the first three fingers of each hand, and are all fingered alike. They are greatly valued in military music, but are not much used in the orchestra.

Say, Jean Baptiste (sā), a French economist; born in Lyons, France, Jan. 5, 1767. He popularized the theories of Adam Smith in France. His best-known work is "Treatise on Political Economy" (1803); but widely read also were "Catechism of Political Economy" (1815), "Complete Course in Practical Political Economy" (1829), and "Views of Men and Society" (1817). His "theory of markets" attracted great attention. He died in Paris, Nov. 15, 1832.

Say, Jean Baptiste Léon, a French statesman and economist; grandson of the preceding; born in Paris, June 6, 1826. He was elected to the National Assembly in 1871, and in the following year became Minister of Finance in the government of M. Thiers. He occupied this position in successive ministries; was appointed ambassador to London in 1880, and soon afterward was elected president of the Senate. Among his works are: "Finances of France"; "State Socialism"; "Democratic Solution of the Tariff Question"; and "Turgot." He edited "The Dictionary of Finance" and "The New Dictionary of Political Economy." He died April 21, 1896.

Say, Thomas, an American naturalist; born in Philadelphia, Pa., July 27, 1787; engaged in business which he abandoned for the study of natural history; was one of the founders of the Academy of Natural Sciences in Philadelphia in 1812; participated in a scientific exploration of the coasts and adjacent islands of Georgia and Florida in 1818; was chief geologist of an expedition to the Rocky Mountains in 1819–1820. He is supposed to have discovered more new species of insects than any naturalist prior to his time. He was the author of "American Entomology" (3 vols. 1824–1828); "American Conchology" (7 numbers); and many valuable papers. He died in New Harmony, Ind., Oct. 10, 1834.

Sayce, Archibald Henry, an English Orientalist; born near Bristol, England, Sept. 25, 1846. His works extend over various fields and are of great importance for comparative philology and history. They include: "Assyrian Grammar for Comparative Purposes" (1872); "Elementary Assyrian Grammar" (1875); "Lectures on the Assyrian Language" (1877); "Babylonian Literature" (1877); "Fresh Light from the Monuments" (1884); "Ancient Empires of the East" (1884); "Assyria: Its Princes, Priests, and People" (1885); "Introduction to the Books of Ezra, Nehemiah, and Esther" (1885); "Hibbert Lectures on the Origin and Growth of Religion as Illustrated by the Religion of the Ancient Babylonians" (1887); "The Hittites" (1888); "Records of the Past" (new series, 1889–1892); "Life and Times of Isaiah (1889); "The Races of the Old Testament" (1891);

"Social Life among the Assyrians and Babylonians" (1891); "A Primer of Assyriology" (1894); "The Higher Criticism and the Verdict of the Monuments" (1894); "The Egypt of the Hebrews, and Herodotus" (1895); "Patriarchal Palestine" (1895); "Early History of the Hebrews" (1897); and "Israel and the Surrounding Nations" (1898). Special mention should be made of his "Principles of Comparative Philology" and "Introduction to the Science of Language," which have passed through many editions.

Sayles, John, an American author; born in Vernon, N. Y., March 9, 1825; was educated at Hamilton College; removed to Georgia in 1844; taught school in Texas; and was admitted to the bar there in 1846; began practice in Brenham; became judge of the Supreme Court of Texas in 1851; and was a member of the Legislature in 1853–1855. He served in the Civil War as Brigadier-General of Texan militia; and in 1880 became Professor of Law in Baylor University. He was the author of "A Treatise on the Practice in the District and Supreme Courts of Texas" (1858); "Treatise on the Civil Jurisdiction of Justices of the Peace in the State of Texas" (1867); "The Masonic Jurisprudence of Texas, with Forms for the Use of Lodges and Grand Lodge" (1879); "Revised Civil Statutes and Laws passed by the Legislature of Texas, with Notes" (1888); besides many others on Texan law. He died in Abilene, Tex., May 22, 1897.

Saynete, an interlude introduced between the prologue and the principal comedy in the Spanish drama, in which music and dancing form prominent features. They are generally of a burlesque or humorous character.

Sayre, David Austen, an American philanthropist; born in Battle Hill, N. J., March 12, 1793; removed to Lexington, Ky., where he became a successful merchant and banker. He was noted for his benevolence; gave $100,000 to found Sayre Institute; and about $400,000 to other benevolent objects. He died in Lexington, Ky., Sept. 11, 1870.

Sayre, Lewis Albert, an American surgeon; born in Battle Hill, N. J., Feb. 29, 1820; was graduated at Transylvania University, Lexington, Ky., in 1839, and at the College of Physicians and Surgeons, New York city, in 1842. In the latter year he became prosector to the Professor of Surgery in the College of Physicians and Surgeons which office he held till made prosector emeritus in 1852. He was surgeon to Bellevue Hospital in 1853–1873; became consulting surgeon to the Charity Hospital on Blackwell's Island in 1859; was one of the founders of the Bellevue Hospital Medical College in 1861; and was Professor of Orthopædic Surgery in that institution till it was consolidated with New York University in 1898, when he was made emeritus professor. He was the first American to remove the head of the femur in hip-joint disease. He performed this operation in 1854, and in seven years had created by this and other original methods a practically new department in his profession. He died in New York city, Sept. 21, 1900.

Sbaretti, Donatus, a Roman Catholic prelate; born in Montefranco, Umbria, Italy, Nov. 12, 1856; was educated at the College of St Apollinaris, Rome, and ordained priest, April 12, 1879. After his ordination he was made Professor of Speculative and Moral Philosophy in the College of the Propaganda, Rome, which office he held for eight years, and later served as sub-secretary of the Propaganda in affairs pertaining to the United States. He arranged the proceedings of the third council of Baltimore for presentation to the committee of cardinals; was private chamberlain to Leo VIII.; and in 1893 was appointed first auditor of the Apostolic Legation at Washington, in which capacity he served till 1900, when he was made Bishop of Havana. In 1901 he was appointed Apostolic Delegate to the Philippine Islands, and in 1902 to Canada.

Scab, in sheep, like itch in man, or mange in horses or dogs, depends on the irritation of three varieties of minute acari, some of which burrow in the skin, especially if dirty and scurfy, causing much itching, roughness, and baldness. The parasite readily adheres to hurdles, trees, or other objects against which the affected sheep happen to rub themselves, and hence is apt to be transferred to the skins of sound sheep. Chief among the approved remedies are diluted mercurial ointments, tobacco water, turpentine and oil, and arsenical solutions such as are used for sheep dipping. One of the best and simplest applications consists of a pound each of common salt and coarse tobacco, boiled for half an hour, in about a gallon of water; to this are added two drachms of corrosive sublimate; and the mixture diluted till it measures three gallons. For each sheep a pint of this mixture should be carefully applied, from a narrow-necked bottle, along the back, and to any other scurfy itchy parts. A second dressing, after an interval of a week, will generally effect a perfect cure. Carbolic acid is probably the most potent remedy used. Where combined with 100 times its bulk of water it has killed acari in two minutes; when used with 50 times its bulk of water, a degree of potency harmless as a dip, it kills in 40 to 90 seconds.

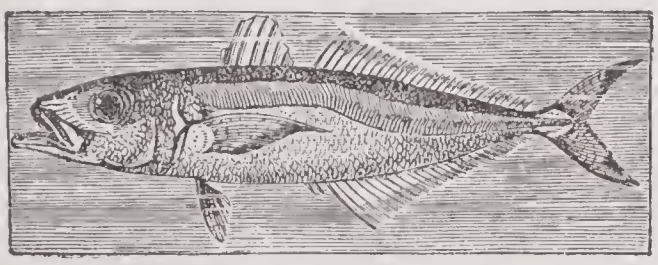
Scabbard, the sheath of a sword or bayonet, made of metal, wood, leather, rawhide, or paper.

Scabbard Fish, the *Lepidopus caudatus*, fairly common in the Mediterranean and the warmer parts of the Atlantic. It is probably a deep sea fish. Its length is from five to six feet, dorsal extending the whole length of the body, which is much compressed. It is well known in New Zealand, where it is called the frost fish and is much esteemed for food.

Scabiosa, the scabious; a genus of *Dipsaceæ*, involucel membranous or minute; receptacle hemispherical, hairy, or with scaly floral bracts; stamens four exserted; fruit with eight depressions; known species about 90, from the Eastern Hemisphere. *S. succisa* yields a green dye, and seems astringent enough to be used in tanning.

Scabious (*Scabiosa*), an extensive genus of annual and perennial herbs, belonging to the natural order *Dipsaceæ*. They are annual or perennial herbs, with entire or divided leaves and heads of blue, pink, white or yellowish flowers. *S. succisa*, devil's bit, is a common plant. It possesses great astringency but no important medicinal virtues, though it was formerly supposed to be of great efficacy in all scaly eruptions. hence the name.

Scad, or **Horse Mackerel** (*Caranx trachurus*, or *Trachurus vulgaris*), a genus of fishes included in the family *Scomberidæ*



SCAD OR HORSE MACKEREL.

or mackerels, and found around the coasts of Great Britain. It appears in large shoals, and the flesh, though coarse, is esteemed and eaten salted during the winter months.

Scadding, Henry, a Canadian author; born in Dunkeswell, Devonshire, England, July 29, 1813; removed to Canada in 1821; was graduated at St. John's College, Cambridge, England, in 1837; became tutor in Upper Canada College in 1838, and in the same year was ordained in the Church of England; was rector of the Church of the Holy Trinity in Toronto in 1847–1875; and president of the Canadian Institute in Toronto in 1870–1876. He was one of the founders of the York Pioneers, and its first president. He was editor of "Canadian Journal of Science, Literature, and History" in 1868–1878; and author of "Memorial of the Rev. William Honywood Ripley" (1849); "Shakespeare the Seer — the Interpreter" (1864); "Four Decades of York, Upper Canada"; "Truth's Resurrection" (1865); "Christian Pantheism" (1865); "Toronto of Old" (1873); "A History of the Old French Fort at Toronto" (1887); etc.; and numerous pamphlets and articles in periodicals.

Scævola, in botany, the typical genus of *Scævolæ*. The young leaves of *S. taccada* are eaten as pot herbs, and the pith of the plant fashioned by the Malays into artificial flowers, etc. *S. bela modogam* is emollient, and is used in India to bring tumors to a head.

Scævola, Caius Mucius, an illustrious Roman, who distinguished himself when Porsenna besieged Rome, 507 B. C. Mucius entered the camp of Porsenna to assassinate him, and by mistake stabbed one of his attendants. Being seized and brought before Porsenna, he said that he was one of 300 who had engaged, by oath, to slay him; and added, "This hand, which has missed its purpose, ought to suffer." On saying this, he thrust it into the coals which were burning on the altar, and suffered it to be consumed. Porsenna, struck with his intrepidity, made peace with the Romans. The name of Scævola, or "Left-handed," was given as a mark of distinction to Mucius and his family.

Scafell (skâ-fĕl′), a double-peaked mountain, the loftiest summit in England, on the Westmoreland border of Cumberland; 14½ miles S. S. W. of Keswick. Of the two peaks, the higher, Scafell Pike, attains 3,210 feet, the other 3,161.

Scaglia, a red, white, or gray argillaceous limestone occurring in the Venetian Alps, and believed by De Zigno to be the age of the chalk. The beds are usually thin, fragile, and almost schistose, whence the name of scaglia.

Scagliola, a term applied to ornamental plaster work, made of finely-ground calcined gypsum worked into a paste with glue. It produces the most perfect imitation of marble, from which it can scarcely be distinguished either by the eye or the touch, as it takes an equally high polish and is equally hard and cold to the touch. In Italy it has long been in use, where it was invented by Guido del Conte, or Fassi (1584–1649), an ingenious mason of Cari, near Correggis, in Lombardy. It has been brought into more general use since that time, and the manufacture has not only improved considerably, but can be executed upon a comparatively small outlay. For columns and other interior decorations it has to a considerable extent superseded the use of colored marbles, being far less costly and quite as durable. In the process of manufacture the purest of gypsum is first broken into small pieces, and after being calcined is reduced to powder. It is then passed through a fine sieve, and mixed with Flanders glue, isinglass, etc. While in this condition it is mixed with different coloring matters, ac-

cording to the shades of color required in the variety of marble to be imitated. In this state it is laid on like cement. After hardening, the next process is to polish it; this is effected first by rubbing with pumice stone, and afterward by rubbing it with tripoli and charcoal on a piece of fine linen, and afterward with felt dipped in tripoli and oil, and lastly with oil alone. One of the chief advantages of this work is that it can be applied to columns made of wood and hollow, or else filled with a plaster core. Columns of this kind do not require that support in the floor beneath which is necessary when solid shafts of marble are employed. The use of scagliola is not confined to columns and pilasters only; it can be applied to other ornamental purposes, such as table slabs, pedestals, borders of floors, etc. By means of it some of the rarest and most costly stones can be imitated; such as porphyry, verde-antico, giallo-antico, and others.

Scala Media, in anatomy, a tubular expansion in the cochlea of the ear, between the *scala vestibuli* and the *scala cochleæ*. It constitutes a keyboard, the keys of which are formed by the extremities of the auditory nerve.

Scalaria, the wentletrap, or ladder-shell; a genus of *Turritellidæ;* according to Tate, the sole genus (with three sub-genera) of *Scalariadæ*, a family of *Holostomata*: shell solid, varices irregular, whorls generally cancellated. About 100 species are known, widely distributed, mostly tropical.

Scald Fish, a marine flat fish, *Rhombus Arnoglossus*, allied to the turbot, sole, and flounder. It is not uncommon on the British coasts.

Scald Head, the popular name of a fungous parasitic disease of the scalp (and occasionally of the face and other parts), known in medical phraseology as *Favus*, *Tinea favosa*, and *Porrigo scutulata*. The primary seat of the parasite is in the lowest portion of the hair follicles, outside the layer of epithelium which covers the root of the hair. The plant is, however, often found in cup-shaped depressions on the surface of the scalp, forming the yellow honeycomb-like masses which suggested the specific name *Favus* (honeycomb) for the disease. The honeycomb crust continues to increase, preserving its circular form and depressed center, till it occasionally reaches a diameter of nearly half an inch. These crusts commonly appear in crops, and may be either distinct or confluent. At a more advanced stage the epidermis disappears, and a viscid fluid is secreted in such abundance as to form one entire incrustation over the entire head; hence the *Porrigo larvalis* — mask- or visor-like scald head. The smell of the scab is peculiar, and has been compared to that of the urine of a cat, or of a cage in which mice have been kept. It is probably due to a species of alcoholic fermentation in connection with the vegetable growth. The scab sometimes resembles a lupine, or a minute shield, rather than the cell of the honeycomb, and hence the varieties of scald head which have been described under the name of *Porrigo lupinosa* and *Porrigo scutulata*. The great point to be aimed at in the treatment of this affection is to destroy the cryptogamic parasite and to eradicate its germ. For this purpose the head should be shaved, and poultices then applied till the scabs are removed. Tar ointment should then be applied, night and morning, the old ointment being washed off with soft-soap and water before the fresh dose is laid on. In the early stage of the disease, in place of the preceding treatment, it is sometimes sufficient to cut the hair close and to wash the affected parts, night and morning, with oil of turpentine. If the disease does not yield to these applications, the same treatment as that recommended for ringworm must be tried.

Scalds. See Burns and Scalds.

Scale, a measure, consisting of a slip of wood, ivory, or metal, divided into equal parts, usually main divisions and subdivisions; as, inches or octonary fractions for carpenters' work, decimal divisions and subdivisions for chain work, duodecimal for plotting carpenters' work, which is in feet and inches. The meter and its decimal subdivisions are also sometimes employed. Also any instrument, figure, or scheme graduated for the purpose of measuring extent or proportions.

In music, the sounds in consecutive order used by various nations in different forms as the material of music. In a proper succession such sounds form melody, in proper combinations they constitute harmony. The modern scale, universally used among the more civilized nations, consists of 12 divisions, called semitones, included in one octave. The ancient Grecks and Asiatics ancient and modern exhibit the use of less intervals. Such scales are called enharmonic. Other nations have intervals of a third between some of the steps. This is exhibited in the Chinese and ancient Scotch scales, and in the scales of some savage nations. A scale containing only five unequal divisions of the octave has been called pentaphonic or, less correctly, pentatonic. All scales are purely arbitrary, consisting of a selection of sounds produced by the aliquot divisions of a monochord. When the divisions of a monochord are slightly altered to suit the required steps in an octave, as is the case in the modern scale, the scale is said to be tempered; when the

harmonic divisions of the monochord are strictly followed, the scale is said to be in just intonation. The modern scale when used as a succession of 12 semitones is called chromatic, when used in the ordinary mixture of tones and semitones it is called diatonic, when the third and sixth are flattened it is called the modern minor diatonic scale, when the third and sixth remain major, the scale is said to be a major diatonic scale. The scale is also called the gamut (French *gamme*) from the words *gamma* and *ut*, the names of sol and do, found in the Guidonian system of overlapping hexachords. The Italian names for the degrees of the scale, *ut, re, mi, fa, sol, la,* are derived from the initial syllables of a Latin hymn quoted in all musical histories. *Ut* was afterward called *do* by many nations, and the name *si* was given to the seventh degree of the scale, when the ancient system of hexachords was converted into the modern system of octaves. When the scales, whatever the pitch, start from *do*, the system is said to be that of the movable *do;* when the first note of the scale is called *do, re, mi,* etc., according to a stated pitch called *do*, the system is called that of the fixed *do*.

In painting, a figure subdivided by lines like a ladder, which is used to measure proportions between pictures and the things represented. Scale of a series, in algebra, a succession of terms, by the aid of which any term of a recurring series may be found when a sufficient number of the preceding ones are given. Scale of longitudes; a scale used for determining geographically the number of miles in a degree of longitude in any latitude.

Scale Fern, a popular name for a British species of fern (*Ceterach officinarum*), so named from the imbricated tawny scales at the back of the fronds. To this plant was formerly attributed a marvelous influence over the liver and spleen.

Scale Insect. See Bark Louse.

Scale Moss, a popular name given to the Jungermannias, plants resembling moss, and belonging to the order *Hepaticæ*. They grow on the trunks of trees, in damp earth, and in similar places, and are so called from the small scale-like leaves.

Scale Tree, an important tree (*Lepidodendron*), fossil remains of which are found in the coal-measures, whose trunk was very regularly marked with ornamental patterns like the scales of some fishes. All portions of this strange tree, or giant club-moss, have been found in great abundance, not only the roots and trunks, but also the branches, leaves, and fruit, and its appearance is very well known. The height was 60 to 70 feet.

Scalene, in mathematics, a term applied to a triangle whose sides are all unequal; also to a cone such that a section made by a plane through the axis perpendicular to the plane of the base is a scalene triangle. In this latter case the term is equivalent to oblique.

Scales, the imbricated plates on the exterior of certain animals, as the pangolins or scaly ant eaters, serpents and other reptiles, and especially fishes. The scales of the latter are developed beneath the true epiderm, and consist of alternate layers of membrane, of horny matter, and occasionally of phosphate of lime. Fishes are sometimes classed, in accordance with the structure of their scales, into Ctenoid, Ganoid, Cycloid, and Placoid. The term scale is applied also, in botany, to a small rudimentary or metamorphosed leaf scale-like in form and often in arrangement, constituting the covering of the leaf buds of the deciduous trees in cold climates, the involucrum of the *Compositæ*, the bracts of catkins, etc.

Scales, Alfred Moore, an American lawyer; born in Reedsville, N. C., Nov. 26, 1827; was educated at Caldwell Institute, Greensboro, and the University of North Carolina; admitted to the bar in 1851; became solicitor of Rockingham county in 1853; represented that county in the Legislature in 1852, 1853, and 1856; was clerk and master of the court of equity from 1853 till the Civil War broke out, when he entered the Confederate army as a private, and was rapidly promoted to the rank of Brigadier-General. He took part in many important battles, including Williamsburg, Fredericksburg, Chancellorsville, and Gettysburg. After the war he resumed law practice; was a member of the State Legislature in 1866–1867; of Congress in 1875–1885; and was governor of North Carolina in 1884–1888. He died Feb. 9, 1892.

Scale, San José. See San José Scale.

Scales of Notation, methods of representing numbers of any magnitude by means of a few symbols. We ordinarily express numbers in terms of the first nine digit symbols and the symbol known as the cipher — *i. e.*, 10 in all. The number "ten" is then represented by 10, a combination of the "one" and cipher symbols, and so on in the familiar manner. Mathematically there is no reason why 10 should be chosen in preference to any other number as the radix of our common scale of notation. Its convenience arises from the way in which it suits our numeration or naming of numbers. Historically the development of decimal arithmetic — of which our denary scale is the highest phase — is intimately connected with the fact that man has 10 fingers. The full significance of the denary scale will be best seen if we take some other number, seven say, as the radix. Our object is now to express all numbers in terms of

the cipher and the first six digits only. The number seven itself will be represented by 10, eight by 11, twelve by 15, fourteen by 20, forty-nine, or seven times seven, by 100, and so on. In other words, 49 to radix 10 is the same number as 100 to radix seven.

Inscriptions of the Assyrians tell of our modern cipher system. It is clear, however, that they were also in possession of a sexagesimal scale as true and as complete as that used much later by the Alexandrians. It was used probably only for purposes of calculation; for in simply representing numbers the Assyrians, if not the earlier Accadians, used another scale, in which a special symbol for 100 was introduced. In this scale, however, the sexagesimal symbolism for 60, 70, 80, and 90 was retained. In the later cuneiform inscriptions of the Persians all trace of the sexagesimal scale is obliterated.

Scaliger, Joseph Justus (skal'i-jer), a French classical scholar, son of Julius C.; born in Agen, France, Aug. 5, 1540. He became one of the most learned men of his age, with a prodigious knowledge of classical antiquities and literature. He was involved in controversy on account of his conversion to Protestantism. Besides notes, criticisms, and essays, on Catullus, Propertius, Vergil, Moschus, and other authors, he wrote: "The Emendation of Time" (1583), a work on chronology and the calendar; "The Treasure of Times" (1606), in which he rearranged the whole chronology of classical antiquity; etc. He died in Leyden, Jan. 21, 1609.

Scaliger, Julius Cæsar (originally Della Scala), a celebrated Italian scholar; born near Lago di Garda, Italy, April 23, 1484.

JULIUS CÆSAR SCALIGER.

He went to France in 1526, and there practised medicine. According to some scholars, "no one of the ancients could be placed above him, and the age in which he lived could not show his equal" in learning and talent. He published an "Oration against Erasmus" (1531), in reply to that scholar's "Ciceronianus"; "Poems" (1533–1574), in Latin, filling several volumes; "Comic Meters"; and a variety of dissertations and essays on classical subjects. He died in Agen, France, Oct. 21, 1558.

Scallop, a well-known bivalve, one of those with a single muscle closing the shell. The valves are fan-shaped, the left often more or less flat, the right more arched; both are marked with sinuous radiating ridges, to which the name *Pecten* (Latin, "a comb") refers. The hinge line is without teeth, and is extended laterally in two ears. The beautiful coloring of the shells is remarkable even among bivalves. On the margins of the mantle there are hundreds of small sparkling eyes of different degrees of visual efficiency. The small finger-shaped foot is usually marked with bright orange or red color. The scallops are widely distributed in all seas, at depths of 3 to 40 fathoms. When young they are active and able to swim a little by rapidly opening and closing their valves, but as they grow older they become more sedentary, and are often found thickly covered with acorn shells, serpula tubes, and zoöphytes. Many species attach themselves by a byssus secretion, but often this disappears in adult life. Some of the larger species are often popularly called clams, a name shared by other bivalves. *P. Jacobæus*, a native of the Mediterranean, is the scallop shell which pilgrims were accustomed to wear in front of their hat in token of having visited the shrine of St. James at Compostella. *P. maximus*, found on many parts of the British coasts, is about six inches broad. About 180 living species are known, and over 400 are recorded as fossils from Carboniferous strata.

Scallop Budding, in horticulture, a method of budding performed by paring a thin tongue-shaped portion of bark from the stock, and applying the bud without divesting it of its portion of wood, so that the barks of both may exactly fit, and then tying it in the usual way.

Scalp, the term employed to designate the outer covering of the skull or brain case. Except in the fact that hair in both sexes grows more luxuriantly on the scalp than elsewhere, the skin of the scalp differs so slightly from ordinary skin that it is unnecessary to enter into any details on this point. But besides the skin the scalp is composed of the expanded tendon of the occipito-frontalis muscle, and of intermediate cellular tissue and blood vessels. Injuries of the scalp, however slight, must be watched with great caution, for they may be followed by erysipelas, or by inflamma-

tion and suppuration under the occipito-frontal muscle, or within the cranium, or by suppuration of the veins of the cranial bones, and general pyæmia that may easily prove fatal. If dressed antiseptically at an early stage the risk of such accidents is of course greatly diminished. In the treatment of a wound of this region no part of the scalp, however injured it may be, should be cut or torn away; and, if possible, the use of stitches should be avoided, as plasters and bandages will generally suffice to keep the separated parts in apposition. The patient should be confined to the house (and in severe cases to bed), should be moderately purged, and fed on non-stimulating but not too low diet. Burns of the scalp are very liable to be followed by erysipelas and diffuse inflammation, but the brain is comparatively seldom affected in these cases. Tumors of the scalp are not uncommon, the most frequent being the cutaneous cysts popularly known as wens, and vascular tumors.

Scalper, a term applied in the United States to a man who buys railroad, theater, or steamship tickets at a discount from people unable to use them, and sells them again at an advance on the price he paid for them. Theaters and transportation companies have devised various plans to break up this trade, but they have for the most part proved ineffectual.

Scalping, the act, peculiar to North American Indian warfare, of partly cutting, partly tearing off a piece of the skin of the head, with the hair attached; whether the victim is alive or dead at the time does not affect the operation. The Indians, with whom scalps are the trophies of victory, have always left a long lock or tuft on the scalp as a challenge. Bounties have, in American history, more than once been offered for scalps: in 1724 £100 (about $500) was offered by Massachusetts for Indian scalps; in 1754, during the French and Indian war, a bounty was offered by the French for British scalps, and by the colonies for Indian scalps; in 1755 Massachusetts offered £40 (about $200) for every scalp of a male Indian over 12 years old, and £20 (about $100) for scalps of women and children.

Scamillus, in classical architecture, a small plinth below the bases of Ionic and Corinthian columns. It was not ornamented with any kind of molding.

Scamander, a small stream in the Troad, in Northwestern Asia Minor; associated with the little river Simois in the story of the Trojan war.

Scammony, in botany, the scammony bindweed. In chemistry, scammonium, a purgative gum resin obtained from the root of *Convolvulus scammonia.* When the root is cut there exudes a milky juice, which dries up to a yellowish-brown, gummy-looking substance. Two varieties are known in commerce, Aleppo and Smyrna, the former

SCAMMONY.

a, portion of root.

being considered the more valuable. It forms flat irregular masses, very brittle, and having a dark gray or blackish hue. Viewed in thin fragments, it appears translucent and of a golden brown color. Genuine scammony should contain from 75 to 82 per cent. of resinous matter, soluble in alcohol, the remainder being wax, gum, starch, etc. It is, however, frequently adulterated, the adulterants being starch, gum, and inorganic salts. Samples have been found to contain not more than 10 per cent. of scammony, and over 60 per cent. of gypsum and chalk. Pure scammony is a powerful drastic purgative and anthelmintic. Montpellier scammony is obtained from *Cynanchum mounspeliacum.*

Scampavia, a fast-rowing war-boat of Naples and Sicily; in 1814–1815 they ranged to 150 feet, pulled by 40 sweeps or oars, each man having his bunk under his sweep. They were rigged with one huge lateen at one-third from the stem; no forward bulwark or stem above deck; a long brass 6-pounder gun worked before the mast; only two feet above water; abaft a lateen mizzen with topsail.

Scandal, Hill of. See HILL OF SCANDAL.

Scanderbeg (properly ISKANDERBEG, or PRINCE ALEXANDER), an Albanian chief whose real name was George Castriota; born in Croia, Albania, in 1403. He was the son of a Christian prince, but was brought up by the Turks and fought for some time for

Amurath II. Becoming possessed of the chief city of his country, which the Turks had taken, he turned against them, abjured Mohammedanism, and raised the whole of Epirus in revolt. For 25 years he withstood all the efforts of the Turks to overcome him, defeating them in 22 battles, even when led by the Sultan. Shortly before he died, he was compelled to yield to superior forces. He died in Alessio, Albania, Jan. 17, 1468.

Scandinavia, the ancient name of the region now comprehending the three kingdoms, Denmark, Sweden, and Norway, or Sweden and Norway alone, and still not uncommonly used. These countries were inhabited in the earliest times by people of the Teutonic stock, and 100 B. C. the natives of Jutland and Schleswig become formidable to the Romans under the name of Cimbri. But it was chiefly in the 9th century that they made their power felt in Western and Southern Europe, where hordes of Northmen, or Vikings, as they were sometimes called, made repeated raids in their galleys. The Old Norse or Scandinavian literature, so far as extant, is of considerable value, having preserved to us not only the old versification peculiar to all nations of Teutonic origin, but also the mythology, history, and laws of the pagan period of those northern countries. Among the most valuable remains are the Edda and the Sagas. See NORTHMEN.

Scandiano, Count of. See BOIARDO, MATTEO MARIA.

Scandium, in chemistry, an element discovered by Nilson in 1879; symbol, Sc; at. wt. 44.91. It occurs, together with the other rare earths, in gadolinite and euxenite, but the metal itself has not yet been isolated. It forms one oxide, scandia or scandium oxide, Sc_2O_3, a white infusible powder, resembling magnesia, sp. gr. 3.8, insoluble in water and acids. Scandium salts are colorless or white, and have an acid, astringent taste, but are of little importance.

Scandix, in botany, the shepherd's needle; the typical genus of *Scandicidæ*. Bracts one or none, bracteole (partial involucre) of five or seven leaves; calyx teeth obsolete; petals obovate, with an inflected point; fruit laterally compressed, with a long beak: Known species 8 to 10; found in the North Temperate zone.

Scansores, an order of birds, popularly known as climbing birds, having the feet provided with four toes, of which two are turned backward and two forward. Of the two toes which are directed backward one is the hallux or proper hind toe the other is the outermost of the normal three anterior toes. This conformation of the foot enables the scansores to climb with unusual facility. Their food consists of insects and fruit; their nests are usually made in the hollows of old trees. The most important families are the cuckoos (*Cuculidæ*), the woodpeckers and wry necks (*Picidæ*), the parrots (*Psittacidæ*), the toucans (*Ramphastidæ*), the trogons (*Trongonidæ*), the barbets (*Bucconidæ*), and the plantain eaters (*Musophagidæ*). Not all of this order are actually climbers, and there are climbing birds which do not belong to this order.

Scapanus, in zoölogy, a genus of *Talpidæ*, founded by Pomel. In general characters they agree with scalops, but resemble condylura in dentition and habit. There are two species, Brewer's shrew mole (*S. breweri*), from the Eastern United States, which probably gave rise to the reports that the common mole (*Talpa europæa*) existed in America, and *S. townsendi*, from the Pacific coast.

Scape, in architecture, the shaft of a column; also, the apophyge of a shaft; also, a botanical term for a flower stalk springing straight from the root, as in the primrose, snow-drop, etc.

Scape Goat, a term applied to one who is made to bear the blame due to another. The idea is drawn from the Jewish ritual, in which a scape goat was a goat designed to 'scape, *i. e.*, escape, as opposed to one killed and offered in sacrifice. Once a year, on the great day of atonement, after Aaron had offered a bullock in sacrifice for the sins of himself and his house (Lev. xvi: 1–6), he was to take two goats "for a sin offering" (5). Lots were to be cast, one for the Lord, and one (8, Authorized Version,) for Azazel (Revised Version, on the margin "for dismissal"). The goat on which Jehovah's lot fell was to be offered for a sin offering.

"But the goat on which the lot fell for Azazel shall be set alive before the Lord, to make atonement for him to send him away for Azazel into the wilderness." Compare Matt. xii: 43; Luke xi: 24.

Before the dismissal Aaron was to lay both his hands on the goat's head and confess his sins and those of the people, putting them on the head of the goat, and send him by the hand of a trusty man into the wilderness, "and the goat shall bear upon him all their iniquities into a solitary land" (22, Revised Version). If Azazel is an evil spirit, then after the sacrifice of the one goat had atoned for and removed the sins of the worshipers, the other scape goat might return those sins in mockery to Azazel, the evil spirit regarded as their author. This is Hengstenburg's view. Rationalism, on the contrary, sees in the narrative a certain remnant of devil worship flourishing perhaps in pre-Mosaic times. Under the later Judaism the goat was thrown over a precipice about 12 miles from Jerusalem. The scape goat is generally considered the clearest type of the substitution

of Christ for sinners, and His eternal removal of their transgressions (Isaiah liii: 11–12; John i: 29; Heb. ix: 28; I. Peter ii: 24).

Scaphaspis, a genus of *Cephalaspidæ*, differing from *Pterichthys* (with which it is sometimes classed) in having the head shield simple. *S. ludensis* is from the Lower Ludlow series; other species occur in the Upper Silurian and Devonian.

Scaphidiidæ, in entomology, a family of clavicornia; boat-shaped beetles, *i. e.*, much narrowed before and behind; antennæ and legs rather long. They are sometimes beautifully spotted, live in fungi, fly well, and are widely distributed over the world. They are generally from a tenth to a third of an inch in length.

Scaphirhynchus, in ichthyology, the shovel-head; a genus of *Acipenseridæ*, with four species; one (*S. platyrhynchus*) from the Mississippi and its affluents, and three others from Central Asia. Snout spatulate; tail entirely enveloped by horny scutes; no spiracles. This genus affords a striking instance of the close affinity of the fauna of North America to that of the N. of Asia.

Scaphism, a barbarous punishment inflicted on criminals among the Persians, by confining them in a hollow tree, in which five holes were made, one for the head, and two each for the legs and arms. The exposed parts were smeared with honey to invite the wasps, and in this situation the criminal was left to die.

Scapolite, a name formerly applied to a mineral species which included many substances of varying composition. It is now used for a group of minerals having certain characters in common; crystallization, tetragonal; hardness, 5–6.5; sp. gr., 2.5–2.9. It includes the following species with their varieties: Sarcolite, meionite, paranthite, wernerite, ekebergite, mizzonite, dipyre, and marialite.

Scaptonyx, in zoölogy, a genus of *Talpidæ*, with one species, *S. fuscicaudatus*, from North China. It is about two and a half inches long, with thick, soft blue-black fur; tail about an inch and a half long. Nothing is known of its habits; in external character it resembles *Urotrichus*, but it has the dentition of *Talpa*.

Scapula, in anatomy, one of the two bones, the other being the clavicle, which together form the pectoral arch or shoulder girdle. The scapula constitutes its posterior part. It is placed upon the upper and back part of the thorax, is articulated with the outer end of the clavicle, and has suspended from it the humerus. In zoölogy, the row of plates in the cup of crinoids, giving origin to the arms.

Scapular, or **Scapulary,** a dress originally worn over their other dress by the monks when at manual labor, but now forming part of the habit of the older religious orders; also a miniature copy of a monk's scapular made of two pieces of cloth, connected by strings, worn by Roman Catholics from motives of devotion. The most celebrated is that of the Carmelites, said to have been miraculously given to St. Simon Stock, general of the order, who died in 1250. There are four other scapulars in use: that of the Trinity, of white linen with a red cross; the Servite scapular of the Seven Dolors, of black stuff; that of the Immaculate Conception, of light blue woolen, and the Red scapular, in commemoration of the Passion. In ornithology in the plural, a series of feathers springing from the base of the humerus, and continued in a longitudinal stripe so as to cover the last series of the quill feathers, with which they are often confounded. In surgery, a bandage for the shoulder blade.

Scapulimancy, divination by a shoulder-blade. It is especially practised in Tartary, where it is very ancient, and whence it may have spread to other countries. The bone is put on the fire till it cracks in various directions, and then a long split lengthwise is reckoned as the "way of life," while cross cracks on the right and left stand for different kinds and degrees of good and evil fortune; or if the omen is only taken as to some special event, then lengthwise splits mean going on well, but cross splits stand for hindrance.

Scarabæus, in entomology, a genus of *Coprinæ*, and the typical one of *Scarabæidæ*. The semicircular clypeus is divided by sharp notches into a series of triangular teeth; the fore legs are retracted. About 70 species are known, all from the Old World. *S. sacer*, formerly *Ateuchus sacer*, is the sacred beetle of the Egyptians, often represented on Egyptian monuments, though Latreille thought it was *S. egyptiorum*, a golden green species. Both deposit their eggs in pellets of dung, which they roll with their hind legs into a hole dug for its reception.

Scaramouch, a personage in the old Italian comedy, dressed in the Spanish or Hispaño-Neapolitan costume, and representing a military personage, a poltroon and braggadocio (a kind of Captain Bobadil), who always ended by receiving a beating from the hands of Harlequin. Hence, a buffoon; a bombastic, pretentious character.

Scarborough, William Saunders, an American educator; born in Macon, Ga., in 1852 of negro parentage; was graduated at Oberlin College in 1875; was Professor of

Classical Greek at Wilberforce University for 19 years and Professor of Hellenistic Greek at the Theological Department of the same institution in 1891–1895. He then returned to the university proper as a Professor of Ancient Languages. He was identified with many learned societies. His publications include "First Lessons in Greek" (1881); "Theory and Functions of the Thematic Vowel in the Greek Verb"; "Our Political Status" (1884); "Birds of Aristophanes, a Theory of Interpretation" (1886); many articles on the Negro question, Negro folklore; etc.

Scarbroite, a soft mineral, mostly white, occurring in fissures and cracks in septaria. Composition uncertain, but it is essentially a hydrated silicate of alumina. Under the microscope it is resolved into a mass of minute crystalline scales resembling those of kaolinite, to which it is probably related. Dana includes it in the group of Allophanes.

Scarfing, a particular method of uniting two pieces of timber together by the extremities, the end of one being cut or notched so as to fit into the other, making the part where the junction takes place of the same thickness as the rest of the pieces of timber.

Scarification, in surgery, the act of separating the gum from the teeth, in order the better to get at them with an instrument; the act of making a number of incisions in the skin with a lancet or scarificator, for the purpose of letting blood or of drawing off a fluid; the act of making incisions generally.

Scarificator, in surgery, an instrument used in dental surgery in separating the gum from the teeth; also an instrument used in cupping. It has a number of lancets whose protrusion beyond the face of the case is adjustable. These are set in a retracted position, and discharged simultaneously by a pull on the trigger, so as to protrude through the apertures in the plane surface and make a number of incisions through the skin. Also a lancet for scarifying the skin or an engorged membrane.

Scarlatina. See SCARLET FEVER.

Scarlatti, Alessandro, an Italian composer, born in 1650, who was the founder of the Neapolitan school of music, in which most of the composers of the 18th century were trained. Scarlatti originated the overture. He is said to have written 200 masses, 100 operas, and 3,000 cantatas. His writings, though they produced a revolution in the style of operatic music, are almost all completely forgotten. He died in Naples, Oct 24, 1725. His son DOMENICO (1683–1757) was considered the greatest harpsichord player (pianist) of his time.

Scarlet, a beautiful bright red color, brighter than crimson. The finest scarlet dye is obtained from cochineal.

Scarlet Bean, or **Scarlet Runner,** a twining plant, the *Phascolus multiflorus,* a native of Mexico, cultivated as a green vegetable or as an ornamental plant.

Scarlet Fever, or **Scarlatina,** a contagious febrile disease, almost always attended during a part of its course by a rash and by sore throat. Sometimes only one of these features is well marked, sometimes both. Though persons of all ages are susceptible to it, it is eminently a disease of children. It is infectious and contagion may be carried by clothing, school-books, etc. Like smallpox or measles it rarely attacks a person more than once. It usually comes on with shiverings and a feeling of lassitude, followed by more or less of fever, restlessness, loss of appetite, headache, nausea, and occasionally by vomiting. The eruption appears on the second or third day in the form of closely aggregated points about the size of a pin's head, with normal skin between, rounded and tending to become confluent. The period of desquamation, owing to excessive production of new epidermis, follows in two or three days. The eruption may be on the face only, the most frequent change being in the throat, the tonsils becoming swollen with catarrhal pharyngitis, tenacious mucous secretion, and œdema, with great difficulty in swallowing. Inflammation of the parotids and other glands often occurs, with suppuration and abscess, destroying the cell tissues, with sloughing, and occasionally fatal hemorrhage. The middle ear is frequently affected in the eruptive stage, often resulting in permanent deafness, and diphtheria is a not unusual complication, leading some observers to treat it as a symptom of scarlatina or eruptive maladies affecting the throat instead of a distinct disease.

Physicians have generally distinguished three different varieties of scarlet fever; viz., *S. simplex,* in which there is a florid rash and little or no affection of the throat; *S. anginosa,* in which both the skin and the throat are decidedly implicated; and *S. maligna,* in which the stress of the disease falls on the throat. Dr. J. H. McCollom, an American specialist, distinguishes five types, in the lightest of which there is "no eruption of the body, temperature little elevated, hands dry and hard; the only sign is the enlargement of the papillas at the tip and edges of the tongue." In malignant cases the eruption, if it appear at all, is livid and partial, fades early, and is attended with a feeble pulse, a cold skin, and extreme prostration of strength. Sometimes the patient sinks at once, and irretrievably, under the virulence of the

poison, and life is extinguished in a few hours. The chance of recovery is much greater in *anginosa,* when the eruption is florid and stands out well; but even here there are various ways in which it may prove fatal. The state of the throat is full of peril, becoming foul and sloughy, and in many cases proves fatal in the second week of the disorder. *S. simplex* is a very mild form of the disease, and deviates only slightly from a state of health. Scarlatina is also dangerous from its tendency to give rise to other complaints, as boils or strumous ulcers, various forms of scrofula, etc. The kidneys are more affected in this disease than any other organ, nephritis being a common accompaniment, and dropsy a very frequent sequela. It is very contagious, the infection persisting for a long time, and tending to attack every member of a family not protected by a previous attack. Its regular course is from two to three weeks, the period of infection being strongest during the process of desquamation, and lasting for about three weeks from the commencement of that process. It is most fatal in the very young, during pregnancy, or in adults suffering from organic diseases, or when complications exist. Death may ensue from pyæmia, septicæmia, pneumonia, or anasarca, being ushered in by convulsions and coma; should the temperature reach 105°, with a pulse over 120, livid eruption, nervousness with typhoid symptoms, hemorrhage of the skin, or vomiting, diarrhœa, or dropsy set in, the prognosis is very unfavorable. There is no known specific for this formidable malady. During the closing years of the 19th century, bacteriologists made earnest but unavailing investigations to discover the microorganism causing scarlet fever. In treating the simplest form of scarlet fever, little else is required than confinement to the house, regulation of the bowels, and the avoidance of all stimulating substances in the matter of diet. In *anginosa,* frequently, all that is necessary is to keep the bowels open by moderate laxatives and watch the progress of the complaint. If the heat of the surface is great and distressing, cold or tepid sponging may be adopted, and if the pulse is hard and strong, some leeches may be applied behind the ear. If delirium come on, the scalp may require to be shaved, and cold water applied to it; and if the fever and delirium are violent, blood may have to be taken cautiously from the arm. When the system seems to be overwhelmed with the strength of the poison, a liberal administration of wine and bark will be required to sustain the flagging powers till the deadly agency has in some measure passed away. As gargles for the throat, a weak solution of chloride of soda or of nitrate of silver is very useful. A solution of chlorate of potash in water (a dram to a pint) is recommended as a drink in this disease. The bowels also require to be carefully watched; and great care is necessary to avoid cold during the period of convalescence.

Scarlet Fish, a name given to the telescope carp, from its brilliant red color.

Scarlet Lake, in painting, a pigment prepared in the form of cochineal; it is of a beautiful transparent red color and excellent body, working well both in water and oil, though, like other lakes, it dries slowly. Strong light discolors and destroys it, both in water and oil; its tints with white-lead, and its combinations with other pigments, are not permanent, yet when well prepared and judiciously used in sufficient body, and kept from strong light, it has been known to last many years; but it ought never to be employed in glazing, nor at all in performances that aim at high reputation and durability.

PAUL SCARRON.

Scarlet Runner. See SCARLET BEAN.

Scarlet Tanager, in ornithology, the *Pyranga rubra,* a summer visitant to the United States, retiring S. in winter. The popular name is derived from the prevailing hue of the summer plumage of the male.

Scarp, in fortification, the interior slope or talus of the ditch next the fortified place and at the foot of the rampart.

Scarpine, an iron shoe, an instrument of torture, heated red-hot. Also a boot made of wood, torture being inflicted by driving wedges between the leg of the victim and the walls of the boot.

Scarron, Paul (skär-rôn*g'*), a French author; born in Paris about 1610. At the age of 30, in consequence of a rheumatic attack, in which he was treated by a quack doctor, he became an invalid for life,— de-

formed and contorted, and suffering continual pain. His best work is the "Comic Romance" (2 vols. 1651–1657, but never completed), the story of a band of strolling actors: it paints manners and characters with great vividness. In this novel Scarron draws on Spanish sources, as he does also in the comedies "The Ridiculous Heir"; "Jodelet"; "Don Japhet of Armenia"; "The Scholar of Salamanca." His travesty of the Æneid (1648–1653) was in its day regarded as a masterpiece of genuine burlesque humor. He married in 1652, Françoise d'Aubigné, who afterward, as Mme. de Maintenon, became the wife of Louis XIV. He died in Paris, Oct. 14, 1660.

Scarus, in ichthyology, parrot wrasses, or parrot fish, a genus of *Labridæ* with 10 species. The jaws form a sharp beak, teeth confluent; dorsal spines stiff, pungent. *S. cretensis* occurs in the Mediterranean; the other nine are from the tropics. The first was held in high repute among the ancients, and is still valued for its exquisite flavor. It feeds on fucus, and the fact that it rolls its food backward and forward in the mouth to masticate it thoroughly probably gave rise to the idea that it was a ruminant.

Scatophagus, in ichthyology, a genus of *Squamipennes*. Two dorsals united at base, first with 10 or 11 spines, anal with four spines; snout rather short; preoperculum without spine; scales very small. Four species, from the Indian Ocean. *S. argus* is one of the commonest Indian shore fishes; it enters rivers freely, and is said not to be very particular in the selection of food.

Scaup Duck, a species of duck, the *Fuligula marila*. It is common in North America and the N. of Europe; and is found in considerable numbers on the British coasts during the winter months. It feeds on small fish and mollusks, and hence its flesh is coarse.

Scavenger's Daughter, a former instrument of torture, consisting of a broad hoop of iron which so compressed the body as to force the blood from the ears and nose, and sometimes even from the hands and feet.

Scepaceæ, in botany, the scepads; an order of diclinous exogens, alliance Euphorbiales. Trees with coriaceous alternate leaves, and membranous stipules forming the scales of the buds. Flowers apetalous, unisexual, males amentaceous; sepals four or five, minute and membranous; corolla none; stamens two to five, with short, inelastic filaments, females in short, axillary racemes; sepals, six, in two whorls; ovary two-celled; style none; stigma with two or four lobes; seeds one or two, pendulous, enveloped in a succulent aril. Found in forests in tropical India. Known genera three, species six.

Scepticism, that negative system of philosophy which, by doubting of everything beyond the region of phenomena, doubts the possibility of all speculation; or, according to Sextus Empiricus, "the power of opposing, in all their contradiction, the sensuous representations and the conceptions of the mind, and thus to induce perfect suspension of judgment." The sceptic, in general, accepts of the phenomena of nature as he finds them, and, convinced of the impossibility of diving beneath the appearances to the real causes of things, contents himself with a spirit of doubt and indifference. The 10 topics of argument used in the schools of the scepties were: (1) That on account of the variety that exists in the organism of different animal bodies, it is probable that the same external object presents different images to different animals, and man has no reason for asserting that his perceptions are more conformable to the real nature of things than those of inferior animals. (2) That even among men there is a great diversity of both mind and body, which necessarily occasions a great variety of opinions, every one judging according to his particular apprehension, while no one is able to determine the real nature of things. (3) That the different senses give different reports of the same thing; and hence bodies may have different properties from those which the senses lead us to suppose. (4) That the same thing appears different, according to the different disposition or circumstances of the person who perceives it; whence it is impossible for any one man to pronounce that his judgment concerning any object is agreeable to nature. (5) That things assume a different aspect according to their distance, position, or place, and no reason can be assigned why one of these aspects should agree with the real object rather than the rest. (6) That no object offers itself to the senses which is not so connected and mixed with others that it cannot be distinctly separated and examined. (7) That objects of sense appear exceedingly different when viewed in a compound and decomposed state, and that it is impossible to say which appearance most truly expresses their real nature. (8) That every object being always viewed in its relation to others, it is impossible to determine what it is simply in its own nature. (9) That our judgment is liable to uncertainty from the circumstances of frequent or rare occurrence, that which happens every day appearing in a very different light from that in which the same thing would appear if new. (10) That mankind are continually led into different conceptions concerning the same thing

through the influence of custom, law, fabulous tales and established opinions.

On all these grounds the sceptics held that every human judgment is liable to uncertainty, and that we can only say concerning anything that it seems to be, not that it is what it seems. They likewise maintained that every proposition requires some previous proposition to support it, *in infinitum* (to infinity), or supposes some axiom which cannot be proved, and is therefore taken for granted without demonstration; that in argument the point assumed and that which is to be proved may often be alternately used in each other's place, both being equally uncertain; and lastly, that nothing can be understood by itself, as appears from the endless disputes of philosophers concerning the nature of things, nor by means of something else while itself remains unknown. This perpetual uncertainty and indecision on every point, this entire abnegation of man's proudest faculty — reason — is contrary to the manifest purposes which man has to serve on earth, and but little accords with the prodigious activity and creative power of the mind. The most celebrated thinkers of this class in ancient times were Pyrrho, Timon, Œnesidemus, and Sextus Empiricus; in modern times, David Hume. The scepticism of Hume is, beyond all doubt, the most thorough and wide-reaching that philosophy has yet witnessed. He starts with the popular theory of experience, and proceeds with surprising coolness to hew down every intelligent principle for which his theory was incapable of accounting. In open argument, in candid statement, and in solid attack, the Scotch sceptic is greatly in advance of his Greek predecessors. His scepticism called forth a host of assailants, and has more or less influenced philosophical thought and opinion since that time, more particularly in the cases of Reid, Stewart, and Hamilton in Scotland; of Jouffroy and Cousin in France; and of Kant, Fichte, Hegel, and Schelling in Germany.

Scepter, a staff or baton borne by a sovereign or ruler as a symbol of office or authority; the ensign of royalty borne in the hand. The English scepter is cruciform.

Schabzieger (schäptz-ē-gār), a kind of green cheese made in Switzerland, and flavored with the flowers of a species of melilot.

Schack, Adolph Friedrich, Count von (shak), a German author; born in Schwerin, Germany, Aug. 2, 1815. His works embrace many subjects, but his especial distinction is as a student and critic of Arabic, Persian, and Sanskrit literature. He published: "History of Dramatic Art and Literature in Spain" (1845–1846); "Poetry and Art of the Arabs in Spain and Sicily" (1865); "History of the Normans in Sicily" (1889); etc. His translations of Oriental classics include "Hero Songs [or epics] of Firdusi" (1851), for which he was decorated by the Shah; "Firdusi" (1853), additional translations; "Strophes of Omar Khayyám" (1878); "Voices from the Ganges," a series of Hindu poems; "Mejnun and Leila", the famous story by Jami; etc. Among his original poems are: "Lotus Leaves" (1882); "Memnon" (1885); "Epistles and Elegies" (1894); etc. He also wrote a work on "Mazzini and Unified Italy." He died in Rome April 14, 1894.

Schadow (sha'dō), **Johann Gottfried,** a German sculptor; born in Berlin, May 20, 1764. He studied drawing and sculpture in his native city till he went to Italy, where he wrought from 1785 to 1787 in the museum of the Vatican and of the Capitol. His first great work was the monument erected in the Dorothea Church, Berlin, to the memory of the Count of the Mark, and this was followed by the colossal statue of Ziethen; the statue of Frederick the Great in Stettin; of Leopold of Dessau in Berlin; of Blücher in Rostock; the Tauenzien monument in Breslau; of Luther in Wittenberg; the quadriga over the Brandenburg gate of Berlin, etc. He died in 1850. Three sons of Schadow devoted themselves to art. The eldest, RUDOLF (or ZENO RIDOLFO); born in Rome, July 9, 1786, gained some reputation as a sculptor, and died in Rome, Jan. 31, 1822; the second, FRIEDRICH WILHELM; born in Berlin, Sept. 6, 1789, became a painter of considerable eminence, and was ennobled in 1843; and the third son, FELIX, likewise became a painter.

Schaeberle, John Martin, an American astronomer; born in Germany in 1853; was taken to Ann Arbor, Mich., where his parents settled in 1854; learned the machinist's trade, but turned his attention to the study of astronomy and was graduated at the University of Michigan in 1876. He was acting Professor of Astronomy at that institution in 1878–1888 and astronomer of Lick Observatory, Mt. Hamilton, in 1888–1898. He had charge of the eclipse expedition of Lick Observatory to Cayenne and Chile in 1889 and 1893, and to Japan in 1896. He discovered three comets, one with a telescope made by himself, and carried on considerable other original investigation. He was a frequent contributor to astronomical periodicals.

Schaeffer, Nathan C., an American educator; born in Berks co., Pa., Feb. 3, 1849; was graduated at Franklin and Marshall College, Lancaster, Pa.; took a theological course and afterward studied abroad; was ordained in the Reformed Church; and was principal of the Keystone

State Normal School in 1877–1893. In the latter year he was made State Superintendent of Public Instruction of Pennsylvania. His publications include: "Thinking and Learning to Think" (1900); and articles on "The Order of Jesuits"; "Church and State in Germany"; "Education Among the Greeks and Romans"; "School Life in Ancient Athens"; etc. He became editor of the "Pennsylvania School Journal" in 1893.

Schafarik, or **Safarik, Pavel Josef** (shä'fä-rik), a Czech author; born in Kobelarova, Hungary, May 13, 1795. He collected Slavic folk songs (published 1823–1827). He translated into his native tongue the "Clouds" of Aristophanes, and Schiller's "Mary Stuart" (1815). His principal work is "Slavic Antiquities" (1837). His "Ground Principles of Old-Czechish Grammar" (1845) marked an epoch in the history of the Czech language. He wrote also: "History of the Slavic Language and Literature" (1826); "The Most Ancient Monuments of the Bohemian Language" (1840). He died in Prague, June 26, 1861.

Schaff (shaf), **Philip,** an American clergyman; born in Coire, Switzerland, Jan. 1, 1819. He studied at Tübingen, Halle, and Berlin; lectured in the latter university in 1842–1844, and then went to America, where he was professor in the theological seminary of the German Reformed Church at Mercersburg, Pa. (1844–1863). In 1864–1869 he was lecturer in several theological institutions, and after 1870 was Professor of Sacred Literature in Union Theological Seminary, New York. He was a prolific writer, his works including: "History of the Apostolic Church"; "Life and Labors of St. Augustine"; "America"; "Germany"; "Through Bible Lands"; "History of the Christian Church"; "Creeds of Christendom"; "Religious Encyclopedia" (as editor), etc. He was president of the American Committee on Bible Revision in 1871. He died in New York city, Oct. 20, 1893.

Schaffhausen, capital of the Swiss canton of the same name, on the Rhine, 25 miles N. W. of Constance, and 23 miles from Zurich. It is a place of antiquity, and has a large parish church, an academy, town library, town hall, and market house. The manufactures are cotton, silk, and leather. The wine raised in the neighborhood is exported. A wooden bridge, of very ingenious construction, is here thrown across the Rhine and forms a channel of communication between this town and the rest of Switzerland. The Falls of Schaffhausen form a cataract of the Rhine, 3 miles from the town, with a descent of about 100 feet. It is one of the most striking waterfalls in Europe.

Schäffle, Albert Edward Friedrich, a German political economist; born in Nürtingen, Würtemberg, Feb. 24, 1831; studied theology at Tübingen, and, after spending some time on the editorial staff of a newspaper, became Professor of Political Economy at Tübingen in 1861, and in 1868 at Vienna. He had sat in the Würtemberg diet, and in 1871 was for a short time Austrian minister of commerce. In that year he returned to Stuttgart, devoting himself to literary labor. His chief works are; "National Economy" (1861; 3d ed. with a new title, "Social System of Human Establishments" (1873); "Capital and Socialism" (1870); Quintessence of Socialism" (1784; 8th ed. 1885; Eng. trans. 1889); "The Fundamental Principles of Taxation" (1880).

Schalstein, or **Schaalstein,** a name given to certain foliated rocks of clastic origin which have been derived principally from clay slates, but sometimes mixed with minerals obtained from igneous rocks. They contain much calcite in veins and nests, and also disseminated, together with chlorite. Texture varying from fine to exceedingly coarse grain resembling breccias.

Schamyl (*i. e.,* Samuel), chief of the Lesghians and leader of the independent tribes in the Caucasus in their 30 years' struggle against Russia; born in Aul-Himry, Northern Daghestan in 1797. He became a priest or mollah, and labored with zeal and religious fervor to compose the numerous feuds of the Caucasian tribes and unite them in antagonism to their common enemy, the infidel Russians. He was one of the foremost in the defense of Himry against the Russians in 1831. In the end of 1834 he was elected "imam," or head of the Lesghians, and soon made himself absolute temporal and spiritual chief of the tribes of Daghestan. He at the same time introduced a change of military tactics, abandoning open warfare for surprises, ambuscades, etc., which brought numerous, and sometimes great successes to the arms of the mountaineers. In 1839 the Russians succeeded in hemming Schamyl into Achulgo in Daghestan, took the fortress by storm, and put every one of the defenders to the sword in order to be quite certain that Schamyl should not escape. But by some mysterious means he did escape, and suddenly appeared preaching with more vigor than ever the "holy war against the infidels." Ten years later he again escaped from the same stronghold after the Russians had made themselves masters of it. The Russians were completely baffled, their armies sometimes disastrously beaten by their unconquerable foe, though he began to lose ground through the long continuance of the struggle and the exhaustion it naturally brought with it. During the

Crimean War he was helped by the allies, who supplied him with money and arms; but after peace was signed the Russians resumed their attacks on the Caucasian tribes with more energy, opened a road over the mountains, thus cutting off one portion of the patriots, and so compelled their submission. On April 12, 1859, Schamyl's chief stronghold, Weden, was taken after a seven weeks' siege, and his authority, except over a small band of personal followers. was wholly destroyed. For several months he was hunted from fastness to fastness, till at last (Sept. 6, 1859) he was surprised on the plateau of Gounib, and after a desperate resistance, in which his 400 followers were reduced to 47, he was captured. He was assigned a residence at Kaluga in the middle of Russia, with a pension of $5,000, and he died in Medina, Arabia, in March, 1871, having taken up his residence in Mecca the year previously. In faith he was a Sufi.

Schandorph, Sophus (shän'dorf), a Danish author; born in Ringsted, Denmark, May 8, 1837. His early poems were an echo of the old Romance poetry; and his dramatic poem "Out in the Forest" (1868) has a like inspiration. Under the influence of Georg Brandes he became a pronounced realist. He wrote: "From the Provinces" (1876), a collection of short tales; "Youthful Days" (1879); "Little Folk" (1880); "Story of Thomas Fris" (1881); "Reminiscences" (1889); etc. He died in January, 1901.

Scharnhorst, Gerhard Johann David von, a Prussian military officer; born in Bordenau, Hanover, Nov. 12, 1756. He entered the army of Hanover, and took part in the campaigns in Flanders of the years 1793–1795. In 1801 he transferred his services to Prussia and was appointed director of the training school for Prussian officers. Five years later he was wounded at Auerstädt and taken prisoner at Lübeck, but released in time to be present at the battle of Eylau. In 1807 he began the great work of his life: he was put at the head of the commission for reorganizing the armies of Prussia. He reformed the army, introduced the short service (Krümper) system, created a better spirit among both officers and men, and so converted what had been a mercenary force into a national army. It was principally by means of this new weapon that Germany was able to crush Napoleon at Leipsic six years later (1813). Scharnhorst was wounded at Grossgörschen while acting as chief of the staff of the Silesian army, and died in Prague, Bohemia, June 28, 1813.

Scheele (sheel), **Karl Wilhelm,** a Swedish chemist; born in Stralsund, Sweden, Dec. 19, 1742; was educated at a private academy in his native town, and then served his apprenticeship as an apothecary at Gotheborg. He subsequently acted as assistant to apothecaries at Malmo, Stockholm, and Upsala. There his genius attracted the attention of the professors at this celebrated university, who encouraged him in his pursuits; but he ultimately ended his days as an humble apothecary in a village on the banks of Lake Moeler. To him we owe the discovery of fluorine, chlorine, and of molybdic, tungstic, arsenic, lactic, gallic, tartaric, oxalic, citric, malic, purpuric, and saclactic acids, glycerine, and oxygen. He ascertained the nature and the constituents of ammonia and prussic acid, the characters of barytes and manganese, and the elements of the atmosphere. Few men of his century, with the exception of Priestley, can be compared with him as a discoverer. He died May 21, 1786.

Scheele's Green, or **Swedish Green,** a pigment consisting of a pulverulent arsenate of copper, first prepared by Karl W. Scheele; it is used both in oil and water-color painting.

Scheererite, a monoclinic mineral occurring in thin tabular or acicular crystals, also granular. Soft; sp. gr., 1 to 1.2; luster, pearly to resinous; color, when pure, whitish to gray; transparent to translucent; tasteless; soluble in alcohol and ether. Composition: carbon, 73; hydrogen, 24 = 97, or as suggested by Dana because of the imperfect analysis, carbon, 75; hydrogen, 25 = 100, the polymere of marsh-gas. Found in lignite at Uznach, Switzerland, and near Manchester, England.

Schefer, Leopold (shā'fer), a German author; born in Muskau, Silesia, July 30, 1784. From 1816 to 1820 he traveled in Austria, Italy, Greece, the Ionian Islands, Turkey, and Asia Minor, and then began to publish his long series of stories. Among them are: "The Countess Ufeld" (1834); "Many Men, Many Minds" (1840), a story of witchcraft; "Divine Comedy at Rome" (2d ed. 1842); "The Sibyl of Mantua" (1852), a pointed satire on the modern conventicle. His chief poetical works are: "Vigils" (1842); "The Layman's Breviary" (1834; 18th ed. 1884); "The Secular Priest" (1846); and "Hafiz in Hellas, by a Hadji" (1853). He died in Muskau, Feb. 16, 1862.

Scheffel, Joseph Victor von (shef'el), a German author; born in Karlsruhe, Germany, Feb. 16, 1826. In 1854 he published his famous epic poem, "The Trumpeter of Säckingen." The historical novel "Ekkehard" came out in 1855. "Gaudeamus" (1868) is a collection of lyrics, many of which became favorite student songs. "Mountain Psalms" (1870) is a collection of poems. He died April 9, 1886.

Scheffer, Ary, a French painter, son of Johann Baptist (a German historical painter); born in Dordrecht, Holland, Feb. 12, 1795; studied under Guérin in Paris, and began his artistic career as a painter of genre pictures. Under the influence of the romanticism of the early 19th century he produced numerous pieces illustrative of Goethe's, Byron's, and Dante's works, such as "Margaret at the Well," "Faust in his Study," "Mignon and her Father," the "Soldiers of Missolonghi," the "Suliote Women," "Francesca da Rimini," "Dante and Beatrice in Heaven," etc. Shortly after 1835 he turned to religious subjects, and painted (but did not always then exhibit) "Christus Remunerator," "Christus Consolator," "The Temptation of Christ," "St. Augustine and Monica," etc. His best portraits were of the Duchess de Broglie, Prince Talleyrand, Queen Amélie, Liszt, Madame Viardot, Madame Guizot, La Fayette, Béranger, and Lamartine. He died in Argenteuil, near Paris, June 15, 1858.

JOSEPH VICTOR VON SCHEFFEL.

Scheffer, Emil, an American chemist; born about 1812. In 1870 he discovered the formula for making liquid pepsin, and two years later one for making the dry or powdered form of pepsin, which created much interest in medical and chemical circles. He died in Louisville, Ky., Jan. 22, 1902.

Scheldt (skĕlt; Dutch, Schelde — *shel'-duh*), one of the most important rivers of Belgium and the Netherlands. It rises in the French department of the Aisne; flows circuitously through Belgium; reaches Ghent, where it receives the Lys; at Antwerp attains a breadth of about 1,600 feet, and forms a capacious and secure harbor. About 15 miles below Antwerp, shortly after reaching the Dutch frontier, it divides into the East and West Scheldt, thus forming a double estuary. The whole course is 211 miles.

Schellenberg, a village 9 miles S. of Salzburg, Bavaria; was the scene of the first engagement in the war of the Spanish succession in which the English took part. Marlborough's army of 40,000 men drove an Austrian corps of 12,000 from the fortified heights above the village, after a short, fierce fight, on July 4, 1704.

Schelling, Friedrich Wilhelm Joseph von, a German philosopher; born in Leonberg, Würtemberg, Jan. 27, 1775. He studied first at Tübingen, where he and Hegel became intimate friends, thence he went to Leipsic and Jena. At Jena he studied under Fichte, whom he succeeded in the chair of philosophy at that university in 1798. In 1803 he was transferred to Wurzburg; and in 1807 to Munich, where he remained till 1841, when he accepted a chair at Berlin. This chair he soon relinquished, and the last years of his life were spent in comparative seclusion. He was the last survivor of that famous band of German philosophers of which Kant, Jacobi, Herbart, Fichte, and Hegel are the other chiefs. By the nature of his speculations, developed in a number of fragmentary publications, chiefly in the earlier part of his life, Schelling's place in the great series of German philosophers is determined to be between Fichte and Hegel. His metaphysical theory is generally known by the name of the "System of Identity." It rests on the principle that the two elements of thought, the objects respectively of understanding and reason, called by the various terms of matter and spirit, objective and subjective, real and ideal, etc., are only relatively opposed to one another as different forms of the absolute or infinite, hence sometimes called the two poles of the absolute. He died in Ragatz, Switzerland, Aug. 20, 1854.

Scheltopusik, or **Sheltopusik,** in zoölogy, the *Pseudopus pallasii*, from Central Russia, Hungary, and Dalmatia. It is dark chestnut-brown, glassy in appearance, and externally it resembles a snake, the fore limbs being entirely absent, and the hind limbs reduced to rudiments. It is from two to three feet long; feeds on insects, mice, and small birds, and becomes exceedingly tame in captivity.

Schenck, Robert Cumming, an American diplomatist; born in Franklin, O., Oct. 4, 1809; was graduated at the Miami University in 1827; studied law; was admitted to the bar, and began to practise in Dayton, O. He was a member of the Legislature in 1841–1842 and was three times elected as a Whig to Congress, serving from Dec. 4, 1843, till March 3, 1851, when he was appointed minister to Brazil. At the outbreak of the Civil War he was appoint-

ed a Brigadier-General of volunteers, and attached to the Military Department of Washington. Later he was assigned to duty under General Tyler and took part in the battle of Bull Run; served in West Virginia under General Rosecrans; led the troops at Cross Keys, and commanded the 1st Division of General Sigel's corps at the second battle of Bull Run. After performing effective services in the Gettysburg campaign he resigned his commission in 1863 to take his place in the National House of Representatives. He was reëlected to Congress in 1866 and 1868, and on Dec. 22, 1870, was appointed minister to Great Britain, but resigned in 1876, in consequence of the failure of the Emma Silver Mine Company in which he was a director. He died in Washington, D. C., March 23, 1890.

Schenck, William Edward, an American clergyman; born in Princeton, N. J., March 29, 1819; was graduated at Princeton College in 1838, and at Princeton Theological Seminary in 1841; was ordained in the Presbyterian Church in 1843; held pastorates in 1843–1852; was secretary of the Presbyterian Board of Publication in 1854–1886 and its editor in 1862–1870. His publications include: "Historical Account of the First Presbyterian Church of Princeton, N. J." (1851); "Church Extension for Cities" (1854); "Aunt Fanny's Home" (1861); "Nearing Home" (1863); "The Fountain for Sin" (1864); "Children in Heaven" (1867); etc. Died Dec. 14, 1903.

Schenectady, a city and county-seat of Schenectady co., N. Y., on the Erie canal, the Mohawk river, and the New York Central and Hudson River, and the Delaware and Hudson railroads; 17 miles W. of Albany. Here are UNION COLLEGE (*q. v.*), Home for the Friendless, Children's Home, public library, Ellis Hospital, court house, State armory, city hall, waterworks, street railroad and electric light plants, numerous churches, National, State, and savings banks, and a number of daily, weekly, and monthly periodicals. The city has manufactories of agricultural implements and machinery, copper and sheet iron, shawls, knit goods, underwear, stoves, steel springs, varnish, sashes, doors, and blinds, electrical apparatus, fire engines, locomotives, pumps, carriages, brushes and brooms, flour, etc., and an assessed property valuation exceeding $12,500,000. Schenectady is one of the oldest cities in New York State. It was settled in 1661; was burned and nearly all the inhabitants massacred by the French and Indians in 1690; and was the scene of a second massacre in 1748. It received a city charter in 1798. **Pop. (1890)** 19,902; (1900) 31,682; (1910) 72,826.

Schenkendorf, Max von (shenk'endorf), a German poet; born in Tilsit, Germany, Dec. 11, 1783. He was educated as a lawyer at the University of Königsberg; and practised his profession till the breaking out of the war in 1813, when he joined the Prussian army, and with his stirring war songs inspired his comrades. His "Gedichte" (1815) is a collection of these songs. He died in Coblentz, Prussia, Dec. 11, 1817.

Scheppegrell, William, an American physician; born in Hanover, Germany, Sept. 22, 1860; was graduated at the Medical College of South Carolina; established a practice in Charleston, S. C.; removed to New Orleans, La., in 1890, and there became a specialist in the treatment of eye, ear, nose, and throat diseases. He invented numerous appliances for treating the ear, nose, and throat. In 1899 he was elected chairman of the board of curators of the Elliott Society of Science and Arts. He became identified with various medical societies in the United States and Europe. His publications include "Electricity in Diseases of the Nose, Throat, and Ear," and articles in medical and scientific periodicals.

Scherenberg, Ernst (shā'ren-berg), a German poet; born in Swinemünde, Prussia, July 21, 1839. His first volume was a collection of poems, "From the Heart's Depths" (1860), which was followed by the cycle "Banished" (1861), "Storms in Springtide" (1865), etc. He wrote also the character sketches "Prince Bismarck" (1885), and "Emperor William" (1888); and the dramatic poem "Germania" (1886). He published in 1874 an anthology, "Against Rome: Voices of German Poets."

Schérer, Edmond (shā-rār), a French essayist; born in Paris, France, April 8, 1815. He first attracted general attention in 1860 with a volume entitled "Miscellanies of Religious Criticism," containing studies of Joseph de Maistre, Lamennais, Le P. Gratry, Veuillot, Taine, Proudhon, Renan, and others. He has also written: "Criticism and Belief" (1850); "Letters to My Pastor" (1853); "Miscellanies of Religious Criticism" (1860); "Miscellanies of Religious History" (1864); etc. He died in Versailles, France, March 16, 1889.

Scherer, Wilhelm (shā'rer), an Austrian philologist; born in Schönbrunn, Austria, April 26, 1841. Among his works are: "German Studies" (1870); "History of Poetry in the Eleventh and Twelfth Centuries" (1875); "From Goethe's Youth" (1879). His "History of German Literature" (1883) has been translated into English. He died in Berlin, Aug. 6, 1886.

Scherr, Johannes (shār), a German historian; born in Hohenreichberg, Würtemberg, Oct. 3, 1817. He studied philosophy and history at Tübingen; became a prolific writer, and was an accepted critic in German literature. Among his principal works are: "History of German Literature" (2d

ed. 1854); "History of English Literature" (1854; 3d ed. 1883); "Blücher, His Life and Times" (3 vols. 1862–1863; 4th ed. 1887). He died in Zurich, Switzerland, Nov. 21, 1886.

Scherzo, in music, a term applied to a passage or movement of a lively and sportive character, forming part of a musical composition of some length, as a symphony, quartet, or sonata.

Scheveningen (skā'veningen), a watering place of Holland, on the W. coast, 1 mile N. W. of The Hague. Scheveningen is a bathing resort of The Hague, with which it is connected by two roads; one, the "Oude Weg" ("Old Road") of the 17th century, bordered by fine trees. Both this and the New Road are traversed by tramways. The town is visited during the season by about 20,000 persons; its beach is one of the finest on the North Sea. In 1570 the W. part of the town was engulfed by an inundation. A naval battle, between the Dutch, under Von Tromp (who was killed in the engagement), and the allied fleets of France and England, was fought off Scheveningen in 1673.

Schiaparelli (skē-ä-pä-rel'le), **Giovanni Virginio,** an Italian astronomer; born in Savigliano, Italy, March 5, 1835; educated at the University of Turin and the observatories of Berlin and Pulkowa. In 1860 he became astronomer at the Milan observatory, and in 1862 its director. He discovered the planet Hesperia in 1861. He was one of the first to discover the connection between comets and meteor streams, and is the discoverer of the double canals bearing his name, on Mars. Among his works are: "The Relation Between Comets and Falling Stars" (1871); "The Precursors of Copernicus in Antiquity" (1873); "Observations on the Movement of Rotation and the Topography of the Planet Mars" (1878-1886). He died July 5, 1910.

Schiavone (skya-vō'nā), **Andrea,** an Italian painter; true name, MEDOLA; born in Sebenico, Dalmatia, in 1522. He studied under Titian, who employed him in the library of St. Mark, where he is said to have painted three entire ceilings. Two of his compositions are in the church of the Padri Teatini at Rimini, and his "Perseus and Andromeda," and the "Apostles at the Sepulcher," are in the royal collection at Windsor, England. He died in 1582.

Schiedam (skē-däm'), a town of South Holland, Netherlands, on the Schie river. Along the site of the walls stand corn and malt mills. The chief edifices and institutions are the town hall, the exchange (the finest building in the town), the Doelen, or gathering place, the Musis Sacrum, a concert hall, the churches, Latin, drawing, commercial, and other schools, a public library, numerous hospitals for the sick, for orphans, and for aged men and women, and other benevolent institutions. The industries include the manufacture of white lead and litharge, linen weaving, flax spinning, copper and iron castings. It is noted for its production of gin and other liquors. There are 220 distilleries in the town and its vicinity. Large numbers of swine are fattened on the refuse of the distilleries. Besides the trade in gin, Schiedam has a considerable commerce in grain and coals. Pop. (1906) 29,227.

Schiller, Johann Christoph Friedrich von, a German poet; born in Marbach, Würtemberg, Nov. 10, 1759. After having studied medicine and become surgeon in a regiment, he, in his 22d year, wrote the tragedy of "The Robbers," which at once raised him to the foremost rank among the dramatists of his country. It was performed at Mannheim in 1782. But some passages of a revolutionary tendency having incurred the displeasure of the Duke of Würtemberg, Schiller left Stuttgart by stealth and made his way to Mannheim, where, after various wanderings and many hardships, he got his tragedy of "Fiesco" brought out on the stage. The tragedies of "Cabal and Love," and "Don Carlos," were his next productions. In 1785 he went to Leipsic and Dresden, where he found many admirers. Here he wrote his singular romance called "The Ghost-seer" and his "Philosophical Letters," and collected materials for a "History of the Revolt of the Netherlands Under Philip II." In 1787 he repaired to Weimar, where he was welcomed with great warmth by Wieland and Herder, undertook the management of a periodical called the "German Mercury," and not long afterward made the acquaintance of Goethe, which soon ripened into a friendship only dissolved by death. In 1789 he was appointed to the chair of history in the University of Jena, and besides lecturing to crowded audiences he published his "History of the Thirty Years' War" and engaged in various literary enterprises which had great influence on the literature of Germany. A periodical called "The Hours" and the "Almanac of the Muses," to which the most eminent men in Germany contributed, belong to this period. He also produced the "Xenian," a

JOHANN SCHILLER.

collection of epigrams, and wrote his "Ballads," which are reckoned among the finest compositions of their kind in any language. About 1790 he exhibited a strong tendency to consumption, which, by precluding him from lecturing, greatly reduced his income; but he was relieved from the pressure of misfortune by the kindness of the Prince of Denmark, who settled on him a pension of $1,000 for three years, and thus enabled him to pursue his studies free at once from narrow circumstances and public duties. He soon after settled at Weimar, in order to direct the theater in conjunction with Goethe; and here at intervals he published the following works: "Wallenstein," "Mary Stuart," "Joan of Arc," and "William Tell." He died in Weimar, Germany, May 9, 1805.

Schilling, Johann, a German sculptor; born in Mittweida, Saxony, June 23, 1828; studied art at Berlin and Dresden. In 1868 he became professor at the Dresden Royal

EVENING, BY SCHILLING.

Academy. His chief works include the "Four Seasons" at Dresden; Schiller statue at Vienna; Maximilian's statue at Trieste; War Memorial at Hamburg; the German National Monument on the Niederwald, opposite Bingen on the Rhine, with a colossal figure of Germania; and the statue of the Emperor William I. at Wiesbaden (1894).

Schinkel, Karl Friedrich, a German architect; born in Neuruppin, Prussia, March 13, 1781. He studied the principles of drawing and design at Berlin, and in 1811 was elected a member and in 1820 a professor of the Berlin Royal Academy. The designs to which he chiefly owes his reputation are those of the Museum, the Royal Guard House, the Memorial of the War of Liberation, the New Theater, the New Potsdam Gate, the Observatory, the Artillery and Engineers' School, all in Berlin, the Casino in Potsdam, another at Glienicke near Potsdam, and a great number of castles, country houses, churches, and public buildings. He also excelled as a painter, and as a designer of monuments and of furniture. His designs and sketches were published in "Collection of Architectural Plans" (174 plates, 1857–1858); "Higher Architecture" (25 plates, 1873); "Rudiments of Practical Architecture" (2 vols. 1835); and "Collection of Furniture Designs" (16 plates, 1852). He died Oct. 9, 1841.

Schinus, in botany, a genus of *Anacardiaceæ*, tropical American trees, with unequally pinnate leaves, having the terminal leaflet long, and panicles of small white diœcious flowers. A substance like mastic exudes from *S. molle*. The Peruvians use it for strengthening their gums. Auguste de St. Hilaire says that those who sleep under the shade of *S. arrocira* are attacked by swellings. The fresh juicy bark rubbed on newly-made ropes covers them with a very durable dark brown coating. The juice is used in diseases of the eye.

Schipka Pass. See SHIPKA PASS.

Schism, an ecclesiastical division in a Church or separation from a Church; as also the tendency to promote such division. The Great Schism or Greek Schism is the separation of the Greek Church from the Latin.

Schism Act, in English law, the Act of Queen Anne, proposed and carried in 1714 by Lord Bolingbroke. It required all teachers to conform to the Established Church of England, and forbade them to be present at any conventicle or dissenting place of worship. It took effect on Aug. 1, 1714, the day on which the queen died, and in 1719 it was repealed by an act of George I.

Schist, a term used for rocks consisting of mineral ingredients arranged so as to impart a more or less laminar structure, that may be broken into slabs or slaty fragments. Such are mica schists, chlorite schists, etc.

Schizandraceæ, in botany, an order of diclinous exogens; alliance Menispermales; scrambling shrubs, with alternate, simple, entire, or toothed exstipulate leaves, often with pellucid dots; flowers small, solitary or clustered, axillary, with imbricated bracts, unisexual; sepals three to six; the outer smaller; petals three to nine, hypogynous; carpels indefinite in number, each one-celled with two pendulous ovules. Fruit an aggregation of pulpy berries, each one- to two-seeded, with spurious dissepiments, the seeds nestling in pulp. Found in India, Japan, and the hotter parts of North America. Known genera 5, species 12.

Schizodon, in zoölogy, a genus of *Octodontinæ,* with two species from Chile and the E. side of the Southern Andes. The folds of the molars meet in the middle. *S. fuscus,* the brown schizodon, a nocturnal animal, passing most of its life underground, is about the size of a rat, dark brown above, dirty yellowish beneath. It burrows in grassy places near mountain streams to such an extent as to render traveling uncomfortable.

Schizopoda, in zoölogy, an old name for the *Mysidæ.*

Schlangenbad (shlang′en-bat), a watering place of Prussia, in Hesse-Nassau, 6 miles W. N. W. of Wiesbaden, among wooded hills. The water has a temperature of from 80° to 88°, and is beneficial in hysteria, neuralgia, rheumatism, gout, paralysis, etc.

Schlegel, August Wilhelm von (shlā′-gel), a German author, son of Johann Adolf; born in Hanover, Prussia, Sept. 8, 1767. He was Professor of Literature in the University of Bonn. His most notable works in literary and art criticism are: "Lectures on Dramatic Art and Literature" (3 vols. 1809–1811), translated into nearly all the languages of Western Europe; "On the Theory and History of the Plastic Arts" (1827). In the field of Orientalism he wrote "Reflections on the Study of the Asiatic Languages" (1832), and prepared editions of several Indian classics. He translated many of the plays of Shakespeare and made the English dramatist a German classic. He translated Dante, Calderon, Camoens, and other foreign masters of literature. He wrote sonnets, an elegy, "Rome" (1812), and other poems. He died in Bonn, Germany, May 12, 1845.

Schlegel, Friedrich von, a German philologist, another son of Johann Adolf; born in Hanover, Prussia, March 10, 1772. He first devoted himself to the study of Greek antiquity, and in 1794 published his great essay "On the Schools of Grecian Poetry"; following it with many others of a like tenor, as "The Grecks and Romans" (1797), and "History of Greek and Roman Poetry" (1798). In his "Fragments" (1798–1800) he essayed to establish the theory of a new romanticism; in the meantime writing the unfinished romance "Lucinda," and a volume of "Poems." He wrote also a tragedy, "Alarcos." His work "Language and Wisdom of the Indians" (1808) was a valuable contribution to the science of language. Among his other writings are lectures on "Modern History" (1811); "History of Ancient and Modern Literature" (1815); "Philosophy of Life." He died in Dresden, Saxony, Jan. 12, 1829.

Schlegel, Johann Adolf, a German poet; born in Meissen, Saxony, Sept. 18, 1721. Of his poetry only a few religious verses remain. He translated and published, with additions of his own, Batteux's "Restrictions of the Fine Arts to a Single Principle" (1759). He died in Hanover, Prussia, Sept. 16, 1793.

Schlegel, Johann Elias, a German poet; born in Meissen, Saxony, Jan. 17, 1719. He wrote several tragedies, among them "Hermann" (the ancient Teutonic hero Arminius) and "Canute"; and two spirited comedies, "The Triumph of Good Women," and "Mute Beauty." He died in Soröe, Denmark, Aug. 13, 1749.

Schleicher (shli-), **August,** a German philologist; born in Meiningen, Germany, Feb. 19, 1821. He was educated at the Gymnasium of Coburg, at Leipsic, Tübingen, and Bonn. In 1850 he was appointed Professor of Comparative Philology at Prague, and in 1857 became Honorary Professor of the Science of Language and Old German Philology in the University of Jena. His published works embrace "Comparative Philology" (Bonn, 1848); "European Languages" (1850); "Etymology of the Slavonian Church Language" (1853); "Manual of Lithuanian Language" (2 vols. 1857); and the well-known "Comparative Grammar of the Indo-European Tongues" (1862). He died in Jena, Germany, Dec. 6, 1868.

Schleiden, Matthias Jakob, a German botanist; born in Hamburg, April 5, 1804; studied law in Heidelberg;, practised in Hamburg as advocate; but in 1833 went to Göttingen and devoted himself to the study of physiology and botany. In 1839 he was called to the chair of botany in Jena, and in 1863 in Dorpat. In 1866 he retired. He contributed greatly to establish the cell-theory; and of his numerous works, including two collections of poems, books on materialism, the sense of sight, the age of man, a "Life" of Linnæus, etc., the most important is his "Principles of Scientific Botany" (1849). He died in Frankfort, June 23, 1881.

Schleiermacher, Friedrich Ernst Daniel (shlī′er-mä*h*″er), a German author; born in Breslau, Prussia, Nov. 21, 1768. His principles of theological criticism are laid down in "Christian Belief According to the Fundamental Doctrines of the Evangelical Church" (2 vols. 1821–1822); a sequel to this is "Christian Morals" (1843). He also wrote an "Introduction to the New Testament" and a "Life of Jesus" (1850). Among his writings on philosophy are: "Dialectics" (1830); "A System of Ethics" (1835); "Psychology" (1835); "Æsthetics" (1842). He died in Berlin, Feb. 12, 1834.

Schleswig, or **Sleswick,** formerly a duchy of Denmark; bounded N. by Jutland, from which it is nearly separated by the Konge Aa river and the Kolding fiord. Prussia took possession of it in 1867 with Holstein, and the two duchies formed the province of Schleswig-Holstein; area, 7,338 square miles. Pop. (1905) 1,504,248.

Schleswig, or **Sleswick,** a seaport of Prussia, in the province of Schleswig-Holstein; situated on the W. end of the Schlei, a narrow inlet of the Baltic Sea; 70 miles N. W. of Hamburg. It was an important port and seat of trade as early as 800. It contains a church founded in 850, the ducal castle of Gottorp, a fine cathedral, and deaf and dumb and lunatic asylums. Among the manufactures are lace, woolen goods, earthern ware, leather, and sugar. Seven annual fairs are held here. In April, 1848, Schleswig was occupied in turn by the Danes and the Allies; in July, 1850, was regained by the Danes; in February, 1864, was occupied by the Austrians; and in 1867 came into possession of Prussia. Pop. (1900) 17,909.

Schlettstadt, or **Schlestadt,** a town of Alsace-Lorraine; 27 miles S. W. of Strasburg. It was made a free city under the Hohenstaufen. In 1634 it was taken by the French, and was fortified by Vauban, 1676; ceded to the Germans, 1870; and the fortress destroyed by them, 1874. Here was discovered, in the 13th century, the art of glazing pottery. It is the birthplace of the reformer, Martin Bucer, 1491. It has manufactories of leather, gloves, cottons, linens, chemicals, beer, spirits, oil, and other commodities.

Schley (slī), **Winfield Scott,** an American naval officer; born in Frederic co., Md., Oct. 9, 1839. He entered the United States Naval Academy in 1854, and began his seafaring experience by making the voyage to Japan on board the United States vessel which escorted the Japanese embassy home in 1860. He remained abroad till the Civil War, when he secured the first prize ship of the war, the "General Parkhill." He was next engaged with the Western Gulf Squadron in the blockade of Mobile Bay, and, being afterward transferred to the gunboat "Winona," patrolled the Mississippi river for a year. He made the original reconnoissance leading to the attack on Port Hudson, at which time the "Winona" received 98 shells in her hull and suffered the loss of 15 or 20 men, but succeeded in evading capture. After the assault on Port Hudson, in which he participated, he remained six months longer on the river, engaged in preparations tending to reduce that stronghold. At the close of the Civil War he was ordered to the Pacific coast, where he performed various missions of a perilous character, being present at the bombardment of Valparaiso and Callao by the Spanish fleet, and during the same cruise he suppressed insurrections at both Middle Chincha Island and La Union, Honduras. He served on the East India and China stations for several years, and in 1871 took part in the attack on the Korean fortifications on the Salee river by leading the assaulting column. Equal in importance to these services in time of war was his voluntary command of the expedition for the rescue of Greely from the desolate shore of Cape Sabine in 1884. The marvelously short period in which this dash into the kingdom of the frost king was accomplished and the starving victims snatched back to their homes and civilization form a bright testimonial to his skill and daring. At the beginning of the American-Spanish War he had attained the rank of commodore, and was chairman of the Lighthouse Board, to which office he was elected by unanimous vote of the board on April 15, 1897. In

REAR-ADMIRAL SCHLEY.

anticipation of the war with Spain, Commodore Schley was, on March 25, 1898, placed in command of the "Flying Squadron" at Hampton Roads, comprising the armored cruiser "Brooklyn," the battleships "Massachusetts" and "Texas," the dispatch boat "Scorpion," and a collier. On May 13, under sealed orders, he steamed out to sea, presumably for the purpose of intercepting and destroying the Spanish fleet under Admiral Cervera, which was reported to be on its way from the Cape Verde Islands to Cuban waters. Disregarding various misleading reports sent out from Madrid as to the movements of the Spanish fleet, Commodore Schley divined the probable course the Spanish admiral would take, and on May 28 arrived off the harbor of Santiago de Cuba, in which the Spanish fleet had taken refuge, and by blockading

the entrance prevented its escape. His squadron was united with Rear-Admiral Sampson's fleet on June 30, and on July 3 the combined fleet, under the personal direction of Commodore Schley, attacked and totally destroyed the Spanish fleet while endeavoring to escape from the harbor. In August, 1898, he was promoted rear-admiral. Owing to the absence of Rear-Admiral Sampson, Schley's ranking officer, from the actual battle of Santiago, a controversy arose between the friends of the two officers as to whom the credit for the victory belonged. Of this discussion neither Schley or Sampson, personally, took any notice till the publication of a work by Edgar Stanton Maclay, entitled "History of the United States Navy." In the third volume of this work, Maclay referred to Commodore Schley as a "caitiff, poltroon, and coward." The proofs of the book had been read and approved by various naval officers, among them Rear-Admiral Sampson; and on July 22, 1901, Schley applied to the Secretary of the Navy for the appointment of a court of inquiry into his conduct. This request was granted on July 24. The court was convened Sept. 12, and its sessions lasted exactly one month. It consisted of Admiral Dewey, president, and Rear-Admirals Benham and Ramsay. The verdict, returned Dec. 14, 1901, was a disagreement; Admiral Dewey refusing to subscribe to the censures on Schley's conduct which were made by the two other members. The majority report found Schley guilty of vacillation, lack of enterprise, and disobedience; while Dewey's report praised Schley for promptness and efficient service, and gave him the credit for the destruction of Cervera's fleet. Schley filed with the Secretary of the Navy objections to the majority report, but it was nevertheless approved by Secretary Long, Dec. 20, 1901. In January, 1902, Rear-Admiral Schley appealed from the verdict to the President, who, however, confirmed Secretary Long's approval. For details of the defeat of the Spanish fleet under Cervera, see SANTIAGO, NAVAL BATTLE OF.

Schliemann, Heinrich, a German archæologist; born in Neubuckow, in Mecklenburg-Schwerin, Jan. 6, 1822. His celebrated archæological explorations and excavations at the sites of Troy, Mycenæ, Orchomenos, Tiryns, and other ancient Hellenic cities, are recorded in "Mycenæ" (1877); "Ilios" (1880); "Orchomenos" (1881); "Troja" (1883); "Tiryns" (1886); "Report on the Excavations at Troy" (1890); "Autobiography" (1891). He died in Naples, Dec. 26, 1890.

Schlosser, Friedrich Christoph, a German historian; born in Jever, Nov. 17, 1776. He wrote: "History of the Iconoclast Emperors of the East" (1812); "History of the World in Connected Narrative" (9 vols. 1815–1824); "General Historic View of the Ancient World and Its Civilization" (9 vols. 1826–1834); "A Judgment of Napoleon and His Latest Traducers and Panegyrists" (3 vols. 1832–1835). He died in Heidelberg, Sept. 23, 1861.

Schlözer, August Ludwig von, a German historian; born in Gaggstedt, Germany, July 5, 1735. After studying at Wittenberg and Göttingen he went as a tutor to Sweden, and lived at Stockholm and at Upsala. In 1759 he returned to Göttingen and commenced the study of medicine. In 1761 he proceeded to St. Petersburg as tutor to the Russian historian Müller, and engaged diligently in the study of the Russian language and history. In 1765 he was appointed a professor in the Academy, but subsequently returned to Germany, having been appointed to the chair of political science at Göttingen, a post held by him till his death. The fruit of his residence and studies in Sweden and Russia was his "Universal Northern History" (1772) and a translation and exposition of Nestor's "Russian Annals" (1802). At a later period appeared his "Weltgeschichte or History of the World" (1792–1801). He died in Göttingen, Sept. 9, 1809.

AUGUST VON SCHLÖZER.

Schmidt, Heinrich Julian, a Prussian author; born in Marienwerder, Prussia, March 7, 1818. He is the author of "History of Romanticism in the Time of the Reformation and Revolution" (2 vols. 1850); "History of German Literature Since Lessing's Death" (1858); "History of Intellectual Life in Germany from Leibnitz till Lessing's Death" (1870); and "History of German Literature from Leibnitz to Our Time" (1886). He died in Berlin, March 27, 1886.

Schmidt, Nathaniel, an American educator; born in Hudiksvall, Sweden, May 22, 1862; took courses at the universities of Stockholm and Berlin; settled in the United States and was Professor of Semitic Languages and Literature at Colgate University in 1888–1896. In the latter year he accepted a similar chair at Cornell University. His publications include "Introduction to the Hexateuch" (1896); "Biblical Criticism and Theological Belief" (1897); "Syllabus of Oriental History" (1897); "The Republic of Man" (1899); and spe-

cial articles on "The Character of Christ's Last Meal" (1892); "Maranatha" (1894); "The Text of Amos" (1894); "Was Bar Nasha a Messianic Title?" (1896); etc.

Schmidt, Maximilian, a German story-writer; born in Eschlkam, Bavaria, Feb. 25, 1832. He is the author of a series of tales of Bavarian life, as: "Popular Stories from the Bavarian Forest" (4 vols. 1863–1868); "The Tenth Commandment" (1879); "The Guardian Spirit of Oberammergau" (1881); "The Good God's Mantle"; "The Golden Saturday" (1883); "The Emmet Witch" (1887); "On the Golden Stair" (1893).

Schmalkald, League of, a defensive alliance concluded at Schmalkalden, April 4, 1531, between nine Protestant princes and 11 imperial cities, with whom other princes and imperial cities subsequently made common cause. The Elector of Saxony and the Landgrave of Hesse were appointed chiefs of the league. The object of this formidable alliance, which included nearly all the Protestant States from Denmark to Switzerland, was the common defense of the religion and political freedom of the Protestants against the Emperor Charles V. and the Catholic States. The confederation was consolidated by the "Articles of Schmalkald," drawn up by Luther at Wittenberg in 1536. A conflict was of course inevitable. In the war of Schmalkald that ensued (1546) when the emperor got leisure to turn his attention to the matter the strength of the Protestants was crippled and dissipated by jealousies, but especially by the defection of Duke Maurice of Saxony, so that in the battle of Mühlberg (April 24, 1547) the Elector of Saxony (the head of the elder branch of the Saxon house, Duke Maurice being the head of the younger branch), Philip of Hesse, and other Protestant chiefs were taken prisoners and their army routed. This caused the league to break up. The Protestant cause was, however, revived five years later by Duke Maurice, who had in the meantime been made elector instead of his unfortunate kinsman, and who, in 1552, returned to his old allegiance to Luther's teaching.

Schmalkalden, an old town of Hesse-Nassau, Prussia; 19 miles S. W. of Gotha; surrounded with double walls; contains a castle, a town hall, in which the historic "articles" were signed; and carries on iron mining and hardware manufactures. It is the birthplace of Karl Wilhelm (1815–1873), composer of the music of "The Watch on the Rhine."

Schneckenburger, Max, a German poet; author of the words of "The Watch on the Rhine"; born in Thalheim, Germany. Feb. 17, 1819. In the Franco-Prussian War "The Watch on the Rhine" attained the rank of a national song and melody; and when the war was over an annual pension of $750 was settled on his surviving family, and also on the composer of the melody, Karl Wilhelm. He died in Burgdorf, near Bern, May 3, 1849.

Schneider, Albert, an American botanist; born in Granville, Ill., April 13, 1863; was graduated at the College of Physicians and Surgeons, Chicago, in 1887; but turned his attention to the study of botany. In 1897 he was made Professor of Botany, Pharmacognosy and Materia Medica in the School of Pharmacy, Northwestern University, Chicago. His publications include "Primary Microscopy and Biology" (1890); "A Text-Book of General Lichenology" (1897); "Guide to the Study of Lichens" (1898); "Microscopy and Micro-Technique" (1899); "Hints on Drawing for Students of Biology" (1899); "General Vegetable Pharmacography" (1900); etc.

Schneider, George, an American journalist; born in Pirmasens, Rhenish Bavaria, Dec. 13, 1823; engaged in journalism there, but was forced to flee the country owing to his participation in the revolution of 1848–1849. In the latter year he settled in St. Louis, Mo., where he founded the "Unsere Zeit," the first abolitionist paper in the State; removed to Chicago in 1851 and there founded the "Daily Staats-Zeitung"; was made United States commissioner for Germany and the Northern countries of Europe and consul to Denmark in 1861 to influence public opinion toward the Federal government, and also to negotiate loans for the United States. In 1862–1866 he was collector of internal revenue; in 1871–1897 was president of the National Bank of Illinois; and in 1892–1893, a director of the World's Columbian Exposition.

Schneider, Hortense Catherine (shnādār'), a French actress; born in Bordeaux, France, about 1838. On the stage playing minor rôles from the age of 15, she made a hit in Offenbach's "La Belle Hélène" in 1864, and continued to be a popular favorite in operas of this class till 1881, when she married and retired from the stage.

Schneider, Louis, a German author; born in Berlin, April 29, 1805. For almost 30 years he was one of the foremost actors of comedy on the German stage. Besides a number of novels and tales of life on the stage, he wrote many successful farces; among them "The Student on His Travels," "The Offer of Marriage in Helgoland," "The Orchestra Leader of Venice." He wrote also "King William: an Account of His Military Life" (1869); and two other works, entitled "Emperor William, 1867–1871" (1875), and "From the Life of Emperor William, 1849–1873" (3 vols. 1888). He accompanied William during the cam-

paign in France. He died in Potsdam, Dec. 16, 1878.

Schnitzer, Edward, better known as Emin Pasha, an African explorer; born in Oppeln, Germany, March 28, 1840. Studying medicine, he graduated in 1864. Proceeding to Turkey, he practised his profession. He adopted the name of Emin, and Turkish habits and customs, entering the Egyptian medical service as Dr. Emin Effendi. In 1878 he was appointed by Gordon Pasha governor of the Equatorial Province. He showed himself an enlightened ruler and a bitter foe to slavery. He added greatly to the anthropological knowledge of Central Africa and published valuable geographical papers. He entered the German service, 1889, and commanded an expedition to Central Africa; made treaties with the Arabs of Tabora, and founded three large German stations on Victoria Lake; established a chain of military posts from Mpwapwa to the interior; in 1891 pressed onward into the heart of Central Africa, and in 1892 S. toward the equator. He was murdered by Arab slave traders in the Kongo Free State, Oct. 20, 1892.

Schnorr von Carolsfeld, Baron Julius, a German painter; born in Leipsic, Germany, March 26, 1794; was trained as a painter by his father (likewise an artist) and at the Vienna Academy. In Vienna he became associated with the German school of Cornelius, Overbeck, Schadow, and Veit, who went back for their inspiration to the old masters anterior to the days of Raphael, and in 1818 he followed them to Rome. But though he agreed with them in principle, he avoided their extremes and was the only one of them who remained a Protestant. For the walls of the Villa Massimi at Rome he executed, as his share of the work, nearly two dozen frescoes from Ariosto's "Roland" (1820-1826). The year after the completion of this labor he was called by King Louis of Bavaria to fill the chair of historical painting in the Academy of Munich, and was besides commissioned to paint for the king's new palace and other royal apartments a series of frescoes illustrative of the "Nibelung Song" and of the lives of Charlemagne, Frederick Barbarossa, and Rudolph of Hapsburg. In 1846 he accepted the appointment of professor at the Fine Art Academy in Dresden, coupled with the directorship of the Royal Picture Gallery. Schnorr's designs for 180 pictures to illustrate the narratives of the Bible ("Bible Pictures," Lond. 1860) are accounted by many authorities the best things he did. Among his easel pictures may be quoted the "Marriage of Cana," "Jacob and Rachel," "Three Christian and Three Heathen Knights of Ariosto," "Ruth in Boaz's Wheat Field," "Christ Bearing the Cross," "Siegfried and Kriemhild," and "Luther at Worms." He died in Dresden, May 24, 1872.

Schœffer, Peter, a German printer; appears to have been at first a copyist at Paris, but was afterward employed in the establishment of Gutenberg and Faust at Mentz. By one account he is said to have discovered the more easy method of casting the types. When Faust and Gutenberg separated, in 1455, he became the partner of the former, after whose death he printed many works alone. His three sons also became eminent as printers. He died about 1502.

Schoen, Charles T., an American capitalist; born in 1844. He recieved an academic education, and first came into prominence as the inventor of the pressed steel coal and general freight railway cars. In 1899 he became chairman of the board of directors of the company controlling this invention, which has proved very successful. He is also identified with other corporate interests.

Schoenborn, August, an American architect; born in Germany about 1822; came to the United States and settled in Wisconsin in 1849. Two years later he went to Washington, D. C., and entered the office of the architect of the National Capitol. He rendered valuable service during the Civil War in preparing maps and plans for General McDowell, as well as for forts, barracks, hospitals, and other buildings for the quartermaster-general. He was best known for his plans for the dome of the Capitol. He died in Washington, D. C., Jan. 25, 1902.

Schofield, John McAllister, an American military officer; born in Gerry, N. Y., Sept. 29, 1831; was graduated at the United States Military Academy in 1853; served on garrison duty in South Carolina and Florida in 1853-55; was assistant Professor of Philosophy at the United States Military Academy in 1855-60, and Professor of Physics in Washington University, St. Louis, Mo., in 1860-61. During the Civil War he served in the Missouri campaign under General Lyon; commanded the Department of the Ohio; took part in the Atlanta campaign; and commanded at the battle of Franklin, Tenn., Nov. 30, 1864, for which he was made Brigadier-General and brevet Major-General in the regular army. After the war he became commander of the Division of the Pacific; was Secretary of War in 1868-69; commanded the army of the United States as senior Major-General; and was promoted Lieutenant-General (a grade created for him) and was retired in 1895. He was the author of "Forty-six Years in the Army" (1897). He died March 4, 1906.

Scholarship, a name given in the universities of Oxford and Cambridge, England, to foundations for maintaining scholars. A scholarship is, like a fellowship, subject to certain regulations and conditions; is inferior to the latter, but superior to an ex-

hibition. In the United States most of the colleges have endowed scholarships. In some cases the power of appointment is vested in certain college officers, and in others the scholarship is won by competitive examinations.

Scholasticism, in philosophy and Church history, the name given to a movement which began with the opening of cloister schools by Charlemagne (742–814), attained its greatest development in the early part of the 13th century under Aquinas and Scotus, and, after receiving a check from the labors of Roger Bacon (1214–1292) and the criticism of Occam (died 1347), gradually subsided at the Renaissance. Scholasticism was the reproduction of ancient philosophy under the control of ecclesiastical discipline, the former being accommodated

DUKE OF SCHOMBERG.

to the latter in case of any discrepancy between them: It had two chief periods: (1) That from Scotus Erigena (died about 886) to the beginning of the 13th century, in which Aristotelian logic and Neoplatonic philosophemes were pressed into the service of the Church; and (2) from this time till the Renaissance and the Reformation, marked by the adaptation of the whole Aristotelian philosophy to theology. Alexander of Hales (died 1245) seems to have been the first scholastic who was acquainted with the whole of Aristotle's works and the Arabian commentaries thereon. In the first period arose the Nominalists and the Realists; in the second the Scotists and the Thomists. See REALISM: SCHOOLMEN: SCOTISM.

Schomberg, Frederick Hermann, Duke of, a German military officer; born in Heidelberg in December, 1618, of an ancient house taking its name from its castle of Schönburg on the Rhine, and fought against the Imperialists in the Thirty Years' War. Entering the French service in 1650, he conducted a successful campaign in Spain, was naturalized in France, and, though a Protestant, obtained a marshal's baton in 1675. On the revocation of the Edict of Nantes in 1685, after some unimportant work done for the House of Brandenburg and the Elector Palatine, he accepted the post of second in command under the Prince of Orange in the English expedition. The new king made him Knight of the Garter, duke, and master of the ordnance, and gave him command of the army in Ireland in 1689. Wintering in Ulster, he joined William III. in 1690, and fought and fell in the battle of the Boyne (July 1). His son MEINHART commanded the right wing and was made Duke of Leinster. But in the War of the Spanish Succession he was recalled as inefficient for his command, and died childless in 1709, the title dying with him.

Schomburgk, Sir Robert Hermann, a Prussian traveler; born in Freiburg, Prussian Saxony, June 5, 1804. He was trained for the mercantile profession and came to the United States in 1829; but in the following year he removed to Anegada, one of the Virgin Isles. Having surveyed the island and laid a report before the Royal Geographical Society, he was charged by that body to lead an exploring expedition to British Guiana in 1835. This enterprise which was surrounded with formidable difficulties, he satisfactorily achieved, and from time to time laid the results of his investigations before the society, in whose "Journal" they were regularly published. It was during this exploration, and while he was ascending the Berbice river, that he discovered, Jan. 1, 1837, the magnificent aquatic plant, the "Victoria Regia," described in his "Description of British Guiana" (Lond. 1840), and his "Views in the Interior of Guiana" (1841). In 1840 he returned to Guiana to survey the colony for the government, and to draw the long controverted "Schomburgk line" as a provisional boundary with Venezuela and Brazil, and was knighted. He was accompanied by his brother Richard, whose "Reisen in Britisch-Guiana, 1840–1844" (1847–1848) embody the results of this expedition. In 1847 the former published an excellent and elaborate "History of Barbadoes," and in the following year departed for Santo Domingo, whither he had been accredited as British consul and representative. In this new sphere he continued to pursue his geographical and scientific researches, the results of which he communicated to the Geographical Society till 1853. In 1857 he was appointed British representative to the Siamese court, but returned to Europe ill in 1864, and died in Schöneberg, near Berlin,

March 11, 1865. His boundary line was the subject of much argument in the British-Venezuelan arbitration tribunal in 1897.

Schönhausen, a village of Prussia, province of Saxony, and district of Magdeburg; 2 miles from the Elbe river; is the birthplace of Prince Bismarck (1815), and is noted as the location of his family estates. Here is the Schönhausen Institute for Young Unemployed Professors, and for the widows and orphans of professors.

Schoodic Lakes, a chain of lakes in Maine, forming a part of the boundary between the State and the province of New Brunswick. The two larger lakes are Grand and First. The outlet of the chain is Schoodic river, which flows into the St. Croix river about 50 miles from its mouth; length, 25 miles.

Schoolcraft, Henry Rowe, an American author, noted as an Indian authority; born in Albany co., N. Y., March 28, 1793. Thirty years of his life he spent among the Indians, and through him many laws were enacted for their protection. Among his numerous publications are: "Travels in the Central Portions of the Mississippi Valley" (1825); "Indian Melodies," a poem (1830); "The Man of Bronze" (1834); "Algic Researches," a book of Indian allegories and legends (1839); and "The Indian and His Wigwam" (1848). He died in Washington, D. C., Dec. 10, 1864.

Schooley's Mountain, a mountain ridge in New Jersey; a continuation of the Blue Ridge in Pennsylvania. It is also the name of a summer resort in Morris co., N. J.; about 18 miles W. of Morristown, and 50 miles W. of New York. Here is a mountain nearly 1,200 feet high, also a chalybeate medicinal spring containing carbonated oxide of iron, with several salts of soda, lime, and magnesia. A seminary of excellent standing is located here.

School, a place, house, or establishment where instruction is given in arts, sciences, languages, or any other branch of learning; a place of education and training in mental or mechanical arts. Also the pupils collectively in any place of instruction, and under the discipline and direction of one or more teachers. One of the seminaries founded in the Middle Ages for the teaching of logic, metaphysics, and theology. They were characterized by academical disputations and subtilities of reasoning. The word is also applied to the disciples or followers of a teacher; those who hold a common doctrine or accept the same teachings; a sect or denomination in philosophy, theology, science, art, etc.; the system of doctrine as delivered by particular teachers; as, the Socratic school of philosophy, the Dutch school of painting, etc.

Education in the earliest periods seems to have been mainly domestic; the parents imparted it, and its character was religious (Gen. xviii: 19; Exod. xiii: 14). Scholars are mentioned in I Chron. xxv: 8 and Mal. 11, 12, but nowhere in the Old Testament is there a word for school, though, according to Dr. Ginsburg, 11 words having that meaning were introduced into Hebrew between the return from Babylon and the close of the Talmudic period. The words for school in most European languages being from the same root, and the Mahrata *sal* = school, being apparently so, schools among the Aryans must be carried back to a remote period. Among the ancient Greeks both boys and girls were taught at public schools (Acts xix: 9; Gal. iii: 24, 25), as was the case with the Romans. The view that India has for centuries possessed a system of village schools, attended by all the boys, is much beyond the truth, and even now only a fraction of the Indian population can read. The missionaries instituted vernacular schools, the government founded some of its own with the Bible excluded, and one or two Indian administrators aided the native schools. In 1854 Sir Charles Wood, afterward Lord Halifax, sent out from London a dispatch on the subject, which led to the subsidizing of every efficient school and ultimately gave a great impulse to education. The number of schools in China has been greatly exaggerated. In England the procedure of the law courts called "benefit of clergy" shows that for centuries there was scarcely a layman even of rank who could read.

Schools therefore were designed chiefly for the education of ecclesiastics. Some were founded in the seats of bishoprics or archbishoprics; thus, Canterbury school existed as early as 1321, and Winchester school and college in 1387. There were various endowed schools in connection with religious foundations, and schools for teaching "grammar" and singing in connection with the chantries. The dissolution of the monasteries under Henry VIII. and of the chantries under Edward VI. led to the establishment of several endowed public and grammar schools. Those founded under the latter ruler are called King Edward's Schools. They still remain and are wealthy. Eton College was founded in 1541, Christ's Hospital or the Blue-coat School in 1552, Winchester refounded in 1560, Rugby founded in 1567, and Harrow in 1585. These "grammar" schools, *i. e.*, schools for teaching Latin and Greek, were, as a rule, for poor orphans, but the education given was one suitable to the upper and middle classes, and in practice they have scarcely affected the lower classes. During mediæval times the view that ig-

norance is the mother of devotion had helped to keep the masses ignorant. To this succeeded the middle and upper class prejudice, not now often avowed, but secretly held by many, that to teach the poor would render them discontented with their lot. The first great improvement arose from the establishment in 1783 in England of Sunday-schools.

Very early in the settlement of the United States the cause of education received a great share of the public attention, and schools of almost every grade were established for the education of the young and for fitting older students for various professions. The first noted foundation in this connection was Harvard College, which began its existence in 1636, under patronage of the Rev. John Harvard. For 57 years this institution was without a rival, but in 1693 at Williamsburg, Va., the College of William and Mary was founded, having for its patrons the King and Queen of England (William of Orange and Mary, daughter of James II.). Eight years later Yale was established, and at once took rank amidst the foremost schools of the world. Pennsylvania University was the next of the noted schools now in existence, being founded in 1740. It was followed by the College of New Jersey at Princeton in 1746. In 1749 Washington College (now Washington and Lee University) was founded at Lexington, Va. New York city was the next on the list, Columbia College in that city being founded in 1754. Rutger's College, New Brunswick, N. J., was established in 1766, and New Hampshire followed with Dartmouth College in 1769.

From this time onward, despite the troublous times of the Revolution, the increase in the number of higher schools was rapid and steady, and today there is not a State in the Union which is not liberally supplied with facilities for its people acquiring higher education. The idea of public schools maintained by the States was also of early date, and in the Northern and Anti-Slavery States was put into practice. In the Southern States the proposition did not meet with favor, the richer classes of the population refusing to allow their children to attend "free" schools, as they were contemptuously called, at the same time being opposed to the education of the "poor white" element, and absolutely forbidding the instruction of negroes, the theory being that education would tend to make these two classes of population restive under the yoke which the laws imposed on them. After the Civil War, however, the slaves having been freed from servitude, the people of the South found themselves face to face with the problem of what to do with several millions of ignorant citizens who could not read or write and were steeped in grossest superstition and almost barbarous. The education of these classes became a paramount necessity, and a system of public free schools was inaugurated in the States which had theretofore had none, and now every State and Territory in the Union has its school system.

In the United States any primary school conducted under the auspices or supervision of any religious denomination is termed a parochial school. In Scotland schools are established in accordance with legislative enactments in different parishes, for the purpose of providing cheap education for the masses. They are called now public schools, and the management of them has been transferred to the school boards. In the United States the terms public schools and common schools mean the same. In England, a name of indefinite application given to certain schools, such as Eton, Harrow, Rugby, Winchester, Westminster, etc., which are attended by a large number of pupils mostly sons of persons of rank and wealth.

See COLLEGES: COMMON SCHOOLS: EDUCATION: PROFESSIONAL SCHOOLS: TECHNOLOGY, SCHOOLS OF, etc.

School Board, in the United States, a committee of citizens elected to take charge of the public schools in any district, town, or city and to control the money appropriated for school purposes.

In England the school board is a body of persons, male or female, elected by the ratepayers in a town or parish, to provide accommodation for the instruction of every child in their district, and having power to compel the attendance of every child between the ages of 5 and 14 at the board schools, unless their education is satisfactorily provided for elsewhere, or unless the child shall have obtained a certificate of proficiency from the government inspector. Children of the age of 13 who have passed the seventh standard may be allowed to attend only half time at school. The school board can make rates for the provision and maintenance of the board schools.

School Savings Banks, a system for encouraging school children in saving their money. It was introduced in the United States by John H. Thiry, of what was then Long Island City, N. Y., in 1885, being modified by him from the methods in use in the schools of England, France, Germany, Italy, and Belgium.

The method of depositing is simple. Teachers devote 10 minutes each Monday morning to the collection of the sums, from one cent upward, which pupils have saved for the bank. When a boy or girl has a dollar to his credit he gets a bank book free. On the last Monday of each month the teacher deposits the collections in a chosen savings institution, and there they

are duly credited to the several depositors, sums of $2 and upward bearing 3 per cent. annual interest. The pupil can only draw on his account by signing a check, which must also bear the signed approval of his parent or guardian and teacher.

The pronounced success of the system of school savings banks has been widely remarked in the public press and by prominent educators and commissioners of education. It was designed not only to stimulate the accumulation of capital on the part of the children who should take an interest in it, but to build up habits of frugality and self-denial in them, to divert their spending money from foolish or injurious to practical channels, and to give them sound ideas of the value of money.

Mr. Thiry insists on the usefulness of his institution as a means of training boys and girls to be honest, capable citizens, instead of rogues and poorhouse inmates. "It is averred," says he, "that crime and pauperism are increasing more rapidly than the population, and threaten to increase still more in the future. Should not this reform movement, then, with its remedial influence, appeal to our public schools? Reformers and philanthropists of the day unanimously declare in the affirmative, for unquestionably many who are to be the tramps, idlers, and criminals of the future are today pupils in our public schools.

"In the proper education of the child lies the solution of important social questions. And popular education should be made to realize in each individual the type of the ideal citizen. Tramps, paupers, criminals, and the vicious who fill the police courts, low resorts, and even our busy streets owe their present condition to a neglected childhood. It therefore behooves the friends of the public schools, reformers, and philanthropists to perceive the need of so adapting our system of education to the culture of the young that it will constantly foster in them the spirit of thrift and economy; and certainly no means is nearer at hand than the introduction of the school savings banks. They are to these virtues of childhood what the links are to the chain."

In May, 1899, Mrs. S. L. Oberholtzer, superintendent of School Savings Banks, World's and National Woman's Christian Temperance Union and general advocate of the school savings bank system, issued a pamphlet containing testimonials from various school superintendents proving the practical success of her system. She says in introduction:

> The school savings bank system, which is used most successfully as an uplifting educational measure and a preventive of pauperism, intemperance and crime in sections of many of the older countries, was introduced into the United States by J. H. Thiry in 1885. Being associated since 1889 with this earnest philanthropist in the promulgation of this popular reform, I am familiar with its progress and benefits, and take pleasure in printing this second circular of testimony regarding the value of the system.
>
> The system of school savings, the collection of the children's savings and earnings at a given time each week and placing them to their individual accounts in bank, where interest accrues and from whence they may be withdrawn by check, instils the principles of self-dependence and thrift.
>
> Because it is a great and independent temperance force in training the Nation above the thoughtless waste that leads to pitiable excesscs and drunkennoss the World's and National Woman's Christian Temperance Union took up this work as a department and are aiding us in its extension.
>
> Because it is a vital educational and economic reform the Commissioner of Education of the United States and the superintendents of public instruction of all the States with whom we have had correspondence extend their hearty cooperation. The letters I have had would fill a volume. The savings deposited by the pupils of our schools in the United States since the system was adopted in 1885, according to our tabulated statistics, have been $630,319.58. There are some schools for which we have no figures.

According to the statistics of the system for the calendar year 1909 as compiled by Mr. Thiry, school savings banks were in operation in 118 cities in 25 States; there were 8,515 banks in 1,168 schools; depositors numbered 203,458; the deposits from 1885 to 1910 aggregated $5,051,644, and withdrawals, $4,180,948; the deposit balance in all banks was $870,696; and the average credit per depositor was over $4.60.

Schooner, a two or three-masted vessel whose sails are of the fore-and-aft class — *i. e.*, extended on booms. The masts have but one splice, the topgallant, if any, forming part of the topmast stick. When a schooner has none but fore-and-aft sails, she is termed a fore-and-aft schooner; if carrying a square foretopsail and foretopgallant sail, a topsail schooner. This latter rig, formerly common, has now become rare. Square-rigged vessels have also lower fore-and-aft sails, denominated spencers or trysails, but these are small and are brailed up to the gaff when furled, instead of being lowered like those of a schooner.

The first seven-masted schooner ever constructed, the "Thomas W. Lawson," was launched in Boston July 10, 1902.

The "Thomas W. Lawson" measures 403 feet over all; 368 feet on the water line; has a beam of 50 feet, five inches, and a load draft of 26½ feet. She has a cargo capacity of about 8,100 tons, and her displacement, when fully loaded, will be about 10,000. Forty-three thousand square feet of canvas will be stretched from seven masts, 155 feet high, the lower masts being steel cylinders 135 feet long, 32 inches in diameter, weighing nearly 20 tons each. The topmasts are of Oregon pine, 58 feet long. The spike bowsprit is of steel 85 feet long, so that from the tip of her bow-

sprit to the tip of her aftermast boom, she will measure 478 feet.

She has six engines, one forward of 40 horse power to work the capstan and hoist her two 10,000-pound stockless anchors, and five others of 25 horse power each to handle the sails and do stevedore work at her six hatchways when she is in port.

The "Lawson" has a double bottom of cellular construction, four feet deep, between the inner and outer plating, divided off into four compartments capable of carrying 1,000 tons of water ballast. Besides this, there is a trimming tank at each end.

Over 2,000 tons of open hearth steel have been used in the construction of the hull, the plating of which is on the joggle system. She has two continuous steel decks, besides a lower deck composed of a tier of beams connected with stringers and tie plates. The ends of the vessel are very strongly built and are connected to each other by stringers between decks running the whole length of the vessel. The vessel has a forecastle and poop deck, a cabin, and two deck houses, besides a wheelhouse. The cabin joiner work is of oak, natural finish, of plain and neat design. The weather decks and deck houses are covered with deck plank. The vessel is steered by both hand and steam power. She has complete plumbing and drainage systems, so connected that each compartment can be pumped out separately, or as a whole, by steam; also by two hand pumps. Steam is supplied by two boilers set at either end of the schooner. A siren whistle will be provided, and the cabin will be piped for steam heating. In addition, an electric plant and a telephone system will be installed. The "Lawson" will carry a crew of 16 men, all told, with Capt. Arthur L. Crowley as her first commander.

Of course, the one great distinguishing feature of the "Thomas W. Lawson" is her seven masts. They are all of the hollow steel design, each being 135 feet high and with a diameter of 31 inches. Twenty-five feet of each mast is hidden from view below decks, and each of them has an approximated weight of 20 tons.

When all her sails are set, the new vessel will carry no less than 43,000 square feet of canvas. This immense amount of sail will be hoisted by steam capstans and windlasses, while her anchors, which are of the stockless type, weighing 10,000 pounds, will be handled with engines.

All the appointments of the "Lawson" are after the most modern and improved plans. The cabins are finished in quartered oak, and it can be said with safety that no skipper or crew of a sailing vessel ever enjoyed any more comfortable and luxurious surroundings than will the 17 men who will compose the complement of the "Lawson."

Despite her mammoth size, the "Lawson" will be one of the finest sights under sail ever viewed on the ocean. Her lines are delicate and symmetrical, and when she is under full sail and favored with friendly breezes her owners expect her to cut through the water at a speed that would do credit to a transatlantic liner.

Schopenhauer, Arthur, a German philosopher; born in Danzic Feb. 22, 1788; son of Johanna Schopenhauer, the popular novelist and littérateur. He studied at Göttingen, attended the lectures of Fichte at Berlin, spent some time at Weimar and Dresden, and led a very restless life till 1831 when he settled at Frankfort-on-the-Main. He was accompanied only by a female servant and a dog, and lived a quiet, reserved, selfishly comfortable life, seeming to some the model of a sage and to others a surly fanatic. He despised his countrymen and their philosophies, read much of French and English literature, and latterly paid much attention to Oriental studies. He became an enthusiast for Buddha and the Vedas, and enjoyed tracing all Western accomplishments to Eastern sources. The principal work of Schopenhauer is entitled "The World as Will and Idea." It appeared in 1819, and after being neglected for many years attracted a good deal of attention and received some sharp blows of criticism. The practical upshot of his system, which makes will the one sole reality, is intolerably melancholy, taking from man all that constitutes his greatness, his goodness, or his bliss. God — futurity — the soul — mere names, illusions; and the world of men is to him bad, hopelessly bad, and made so. Strange, melancholy, and deterrent, the speculations of Schopenhauer are likely to remain a monument of dark genius rather than a light of philosophy. They form no center of warmth and hope, but the funeral pyre on which faith and trust and aspiration immolate themselves. Schopenhauer published several other works of philosophy, of which the most important is "The Two Sound Problems of Ethics." He died in Frankfort-on-the-Main, Sept. 21, 1860.

Schoppe, Kaspar. See SCIOPPIUS.

Schott, Charles Anthony, an American scientist; born in Mannheim, Germany, Aug. 7, 1826; was graduated at the Polytechnic School in Carlsruhe; settled in the United States in 1848, and became connected with the United States Coast and Geodetic Survey; was made assistant of that survey in 1856; was sent to the International Conference on Terrestrial Magnetism, Bristol, England, in 1898; became identified with numerous scientific and philosophical societies. His publications include articles on tides, hydrography, terrestrial magnetism, physics, and meteorology. He died July 31, 1903.

Schottische, a quick kind of dance, perfomed by two persons, and danced in common time; may be described briefly as a combination of the polka and mazourka. In music, a piece of music set in appropriate time to the steps of such a dance.

Schouler, John, an American naval officer; born in Lowell, Mass., Nov. 30, 1846; was graduated at the United States Naval Academy in 1864; promoted captain in June, 1898; was chief of staff of the North Atlantic Squadron in 1895–1897; and was afterward assigned to special duty in the Bureau of Navigation. He was retired as rear-admiral November, 1899.

Schrader, Frank Charles, an American geologist; born in Sterling, Ill., Oct. 6, 1860; was graduated at the University of Kansas; was an instructor of geology at Harvard University in 1895–1896. In the latter year he became connected with the United States Geological Survey; was assistant geologist in an expedition to Yukon, Alaska, in 1896, in one to Idaho and Arizona in 1897; etc. In 1901 he had charge of the geological work in the expedition to the Arctic coast of Alaska.

Schrader, Frederick Franklin, an American journalist; born in Hamburg, Germany, Oct. 27, 1857; settled in the United States with his parents in 1869; received an academic education; was managing editor of the Denver "Republican" in 1879–1881, and of the St. Joseph "Herald" in 1882–1884; was the Washington correspondent of the St. Louis "Globe-Democrat" in 1891–1894, and political writer for the Washington "Post" in 1894–1896. In the latter year he became correspondent of a syndicate of Western papers. His publications include: "Jose" (1890); "Alexandre Dumas' 1001 Specters" (1901); the plays "At the French Ball"; "The Man from Texas"; "The Gascon"; etc.

Schreiner, Olive, a South African novelist; born in Cape Town, Africa, 1863. She is the daughter of a Lutheran minister, and was married in 1890 to Mr. Cronwright, an Englishman of the colony. She published her first and most noted book, "The Story of an African Farm," under the pseudonym "Ralph Iron," at the age of 20; "Dreams" (1890); "Dream Life and Real Life" (1893); "Trooper Peter Halket" (1897); "An English South African's View of the Situation" (1899).

Schroeder, Seaton, an American naval officer; born in Washington, D. C., Aug. 17, 1849; was graduated at the United States Naval Academy in 1868; promoted ensign in 1869, and assigned to duty in the Asiatic squadron, becoming master in 1870, and lieutenant in 1872. Subsequently he served in the Hydrographic Office; was detailed to special duty in the Mediterranean; attached to the Fish Commission steamer "Albatross"; etc. He was assigned to the battleship "Massachusetts" in 1896 and served on that vessel through the American-Spanish War; was made secretary of the Naval Inspection Board; and in 1900 was appointed governor of the island of Guam.

Schubart, Christian Friedrich Daniel, (shö'bart), a German poet; born in Obersontheim, March 24, 1739. Among his lyrics are: "Witcheries" (1766); "Death Songs" (1767); "The Grave of the Princes"; "Ode on Frederick the Great." He died in Stuttgart, Oct. 10, 1791.

Schubert, Franz Peter, an Austrian composer; born in Vienna, Austria, Jan. 31, 1797. He belonged to a family distinguished for their musical talents, and from his earliest years showed so strong a bent to musical studies and composition that the wishes of his friends, who would have made him a philosopher, gave way, and he was allowed to follow his true calling. At seven years of age he was the pupil of Michael Holzer; became a chorister in the imperial chapel, and the pupil of the court organist and of Salieri. He studied the works of Haydn, Mozart, and Beethoven, and gave lessons in music for a living. The number and variety of his compositions is extraordinary. The most admired is his "Songs," and among them "The Erl King," and "Ave Maria," are perhaps the best known. But he wrote also operas, sonatas, symphonies, overtures, cantatas, six masses, etc. He left numerous works unpublished at the time of his death. Schubert spent almost his whole life at Vienna, and died there Nov. 19, 1828.

OLIVE SCHREINER.

Schubert, Gotthilf Heinrich von, a German philosopher; born in Hohenstein, Saxony, April 26, 1780. Among his works are: "Inklings of a General History of Life" (1806); "Views of the Night Side of Natural Science" (1808); "Symbolism of Dreams" (1814); "The Primordial World and the Fixed Stars" (1822); "History of the Soul" (1830); "Old and New Concerning the Inner Life of the Soul" (5 vols. 1817–1844); "Ailings and Perturbations of the Human Soul" (1845). He died in Munich, July 1, 1860.

Schücking, Christoph Bernhard Levin, a German novelist; born in Clemenswerth, Sept. 6, 1814. Among his numerous works are: "A Castle by the Sea" (1843); a volume of "Poems" (1846); "A Son of the People" (1849); "The Peasants' Prince" (1851); "Luther at Rome" (1870); "Saints and Knights" (1873); "Life Recollections" (1886). He died in Pyrmont, Aug. 31, 1883.

Schücking, Luise, a German novelist, wife of Levin; born (Von Gall) in 1815. She wrote the comedy "A Bad Conscience" (1842); "Stories for Ladies" (1845); "Against the Current" (1851); "The New Crusader Knight" (1853). She died in 1855.

Schulz, Eduard. See FERRAND, EDUARD.

Schulz, Johann Abraham Peter, a German musical composer; born in Lüneburg, Germany, March 30, 1747. Among the most popular of his songs are: "On the Rhine, On the Rhine"; "Lo, the Heavens, How Clear"; "Last Hour of the Year." His oratorios and choruses, his songs from Racine's "Athalie," and his operas "Minona" and "Aline," rank among the best productions of his time. He died in Schwedt, June 10, 1800.

Schulze Ernst, a German poet; born in Celle, March 22, 1789. He wrote an epic romance, "Cecilia" (1818); "The Magic Rose" (1818), a romantic narrative poem, his best work; "Miscellaneous Poems" (1820). He died in Celle, June 29, 1817.

Schulze-Delitzsch, Hermann, a German social economist; born in Delitzsch, Germany, Aug. 29, 1808. He wrote: "Chapters of a German Workingman's Catechism" (1863), an anti-socialist tract; "The Laboring Classes and Associationism in Germany" (2d ed. 1863); "Money-Advance and Credit Associations as People's Banks" (5th ed. 1876). He died in Potsdam, April 29, 1883.

Schumann, Robert, a German musical composer; born in Zwickau in the kingdom of Saxony, June 8, 1810. He studied law at Leipsic, but in 1830 finally devoted himself to music under the tuition of Friedrich Wieck and Heinrich Dorn. The daughter of the former, the celebrated pianiste, Clara Wieck (born 1819), became his wife in 1840. In 1834 he commenced his "A New Musical Periodical," a journal which was to herald an ideal music, and which, for the 10 years of his more intimate connection with it, exercised an important influence on the development of the art not incomparable with that of Lessing's "Hamburg Dramaturgy" in drama. Prior to 1840 his principal works were the "Fantasias," the "Scenes of Childhood," the "Etudes Symphoniques," the "Kreisleriana," the "Abegg" variations, the "Papillons," the "Carnival," and two sonatas in F sharp minor and G minor. In the year following his marriage he published nearly 150 songs, many on Heine's words, and all marking an advance on previous composers in the fidelity and subtilty with which they reproduced the most delicate shades of meaning in the poems selected for musical treatment. He then commenced his great series of orchestral works, his symphony in B flat being first performed at the close of 1841. It was followed by his "Overture Scherzo and Finale," his D minor symphony, three quartets, the piano quintet and quartet, the cantata "Paradise" and the "Peri," the C major symphony (1846), "Genevieve" (1847); "Manfred" (1848); the Faust music (1850), the E flat symphony (1851), and other works. Under stress of work, however, his reason failed him, and after an attempt to drown himself in 1854 he was confined in a lunatic asylum, where he died July 29, 1856.

Schurman, Jacob Gould, an American educator; born in Freetown, Prince Edward's Island, May 22, 1854. He won the Gilchrist Dominion scholarship, 1875; was graduated at London University, 1877; was Professor of Philosophy in Acadia College, 1880–1882; in Dalhousie College, Halifax, 1882–1886. He became Professor of Philosophy at Cornell University, and president in 1892. In 1899 he was appointed president of the first Philippine Commission. He has published: "Kantian Ethics" (1881); "The Ethical Import of Darwinism" (1887); "Agnosticism and Religion"; "A Generation of Cornell" (1898); and "Report of the Philippine Commission." He was also editor of the "Philosophical Review."

Schurz, Carl, an American statesman; born in Sibhar, near Cologne, Prussia, March 2, 1829; he was a student at Bonn in 1847–1848. In the early part of 1849 he participated in the revolutionary movements in the Palatinate and at Baden, and on the defeat of the insurrection fled to Switzerland to escape arrest. About 1852 he came to the United States, and settled in Madison, Wis. He soon identified himself with the Republican party. He advocated the election of Fremont in 1856 by public speeches in the German language. He afterward made political speeches in English,

CARL SCHURZ.

and achieved a high reputation as an orator. In 1860 he addressed the people of various States advocating the election of Abraham Lincoln. In 1861 he was appointed minister to Spain, but when the Civil War broke out he resigned that he might return and join the Union army. He took part in the second battle of Bull Run, and commanded a divison at Chancellorsville, May, 1863, and a corps at Gettysburg, July 1–3 of that year. He resigned from the army in 1865, and in 1866 became editor of the Detroit "Post." In 1868 he went to St. Louis, and in 1869 was elected United States Senator from Missouri. He supported Mr. Greeley for President in 1872, and Mr. Hayes in 1876, and was Secretary of the Interior, under the latter, from 1877 to 1881. In 1881-1884 he was editor of the New York "Evening Post," and was conspicuous in the "Mugwump" movement of 1884. In 1892 he became president of the National Civil Service Reform League. He afterward wrote several books, among them a "Life of Henry Clay." He died May 14, 1906.

Schussele, Christian, an American artist; born in Guebvillers, Alsace, April 16, 1824; was a pupil under Paul Delaroche and Adolphe Yvon in 1842–1848. He settled in the United States in the latter year and engaged in chromo-lithography; later he devoted most of his time to painting; and was Professor of Painting and Drawing in the Pennsylvania Academy in 1868–1879: His principal works include: "Clear the Track" (1851); "Franklin before the Lords in Council" (1856); "Men of Progress" (1857); "Zeisberger Preaching to the Indians" (1859); "The Iron Worker and King Solomon" (1860); "Washington at Valley Forge" (1862); "Home on Furlough"; "McClellan at Antietam" (1863); "Queen Esther denouncing Haman" (1869); and "The Alsatian Fair" (1870). He died in Merchantville, N. J., Aug. 20, 1879.

Schuyler, Eugene, an American diplomatist; born in Ithaca, N. Y., Feb. 26, 1840; was graduated at Yale University in 1859 and at the Law School of Columbia University in 1863; and was engaged in the practice of his profession till 1866. He was United States consul at Moscow in 1866–1869, and at Revel on the Gulf of Finland in 1869–1870; secretary of the United States legation at St. Petersburg in 1870–1873; consul-general at Constantinople in 1876–1878; consul at Birmingham, England, in 1878–1879; consul-general at Rome, Italy, in 1879–1880; charge d'affaires and consul-general at Bucharest in 1880–1882; minister resident and consul-general to Rumania, Servia and Greece in 1882–1884; and consul-general at Cairo, Egypt, in 1889–1890. He made a remarkable tour through Turkestan, Khokan, and Bokhara; investigated the Turkish massacres in Bulgaria; and was authorized to conclude the commercial treaties with Servia and Rumania. On his return to the United States in 1884, he engaged in literary work and published: "Peter the Great, Emperor of Russia"; "American Diplomacy and the Furtherance of Commerce"; etc. He died in Cairo, Egypt, July 18, 1890.

Schuyler, Philip, an American military officer; born in Albany, N. Y., in November, 1733. He served in the war against the French and Indians in 1756. In June, 1775, he was commissioned commander of an army in New York with the rank of Major-General. He was about to move the army into Canada, but he was taken sick, and was succeeded in September by General Montgomery. He was appointed delegate to the Continental Congress later in the same year, and was again a delegate in 1777. In the latter year also he commanded the Continental forces against General Burgoyne, but was superseded by General Gates, in consequence of the jealousy with which Congress regarded him. His conduct was vindicated by a court of inquiry. Later he rendered important services in military affairs, but he declined to take command of an army. He was a member of the Congress in 1778, and while holding that post resigned from the army in 1779, remaining in Congress till 1781. He was Federalist United States Senator from New York in 1789–1791, and was again elected a Senator, in place of Aaron Burr, in 1797. One of his daughters was the wife of Alexander Hamilton. He died in Albany, Nov. 18, 1804.

Schuyler Lake, a small lake in Otsego co., N. Y. Its outlet is the Susquehanna river. It is about 8 miles N. W. of Cooperstown and is 24 miles S. E. of Utica; length 5 miles.

Schuylkill, a river of Pennsylvania, which rises in the N. side of the Blue Mountains, runs S. E., passes through the confines of Philadelphia, and unites with the Delaware 5 miles below that city. It is 120 miles long, and navigable for boats of 300 or 400 tons to Philadelphia.

Schuylerville, a town of New York, in Saratoga County, on the Hudson River and the Fitchburg railway; 35 miles N. of Albany and about 10 E. of Saratoga. Near here Burgoyne surrendered to Gates, and the event has been commemorated by the Saratoga battle monument, the cornerstone of which was laid on Oct. 17, 1877—the 100th anniversary of the surrender. In niches on three sides are bronze statues of Generals Gates, Morgan, and Schuyler. The south niche, naturally for a statue of Arnold, is left vacant. The surrounding region is agricultural, and the town has industries connected with dairy products. Pop. 1900, 1,601.

Schwab, Charles M., an American capitalist; born in Williamsburg, Pa., April 18, 1862. After driving a stage-coach for a time, he entered the service of the Carnegie Company as a stake-driver in the engineer corps of the Edgar Thompson works. He rose rapidly, becoming superintendent of the Homestead works, and then president of the Carnegie Steel Company. In 1901-3 he was president of the United States Steel Corporation, and upon his retirement from that office, became a director and a member of the financial committee of the corporation. He established an industrial school at Homestead.

Schwab, John Christopher, an American librarian; born in New York, 1865. He studied at Yale, Berlin, and Göttingen, in 1892 became editor of the Yale "Review," and in 1905 librarian of Yale University. He published a "History of New York Property Tax" (1890); "The Confederate States of America" (1901), and other works.

Schwabach, a town of Bavaria, in the province of Middle Franconia, 9 miles S. of Nuremberg. Gold and silver wire, and the well-known Schwabach needles are the principal articles manufactured. Among the public buildings is the Church of St. John (1469), with a fine altar-piece and paintings of note. In 1529 the Schwabach Articles, the basis of the Augsburg Confession, were drawn up here. Pop. 1900, 9,385.

Schwabach, Articles of, a confession of faith drawn up by Luther for the princes and cities assembled in 1529 at Schwabach. The cities of Southern Germany, inclining to the Swiss doctrine, refused to subscribe, and these articles, adopted by the Schmalkaldic League, became thus a chief obstacle to a union between the party of Luther and Zuinglius.

Schwan, Theodore, an American military officer; born in Germany, July 9, 1841, came to the United States and enlisted as a private in the regular army in 1857; served creditably during the Civil War; was promoted 1st lieutenant in 1864, and brevetted major for gallant and meritorious services in 1867. In 1898 he was appointed a Brigadier-General of volunteers, and won distinction in the Philippines, where he captured Cavite, Viejo, San Cruz and other places in the province of Cavite. He was promoted Brigadier-General, U. S. A., in February, 1901.

Schwanthaler, Ludwig Michael, a German sculptor; born in Munich, Aug. 26, 1802; the descendant of an old family of Tyrolese sculptors, and was trained in the Munich Academy of Art and in his father's workshop. After a visit to Rome he set up a studio at Munich, and, being brought under the notice of King Louis, was charged to execute for the Glyptothek several bas-reliefs and figures. In 1832 he revisited Rome for the purpose of preparing models for the national monument at Valhalla and the Pinakothek. On his return to Munich (1834) he began his bas-reliefs and sculptures for the Königsbau. In 1835 he was appointed professor at the Munich Academy. The number of his works is singularly great, while their excellence places him in the first rank of German sculptors. The multitude of his commissions is responsible for a good deal of work being left to his assistants, and for the lack of careful finish such work shows. Among his remaining efforts may be mentioned two groups for the gable ends of the Valhalla, the colossal statue of Bavaria, 60 feet high, that stands in front of the Temple of Fame, statues of Goethe, Jean Paul Richter, and Mozart, of Venus, Diana, Apollo, Bacchus, etc., and many others, both groups and single figures. He died Nov. 28, 1848, leaving his models to the nation.

Schwartz, Berthold, a monk of the order of Cordeliers, at the end of the 13th century, was a native of Fribourg, in Germany, and an able chemist. It is said that as he was making some experiments with niter he was led to his invention of gunpowder, which was first applied to warlike purposes by the Venetians in 1300. There is, however, much discrepancy in the accounts of this discovery; and it is certain that Roger Bacon, who died in 1292, was acquainted with an inflammable composition similar to gunpowder.

Schwarzburg-Rudolstadt, a German principality, consisting of several isolated portions, situated between Prussian Saxony, the Saxon duchies, and the principality of Reuss. It lies on the N. side of the Thuringian Forest, and has an area of 362 square miles. The surface is rugged, and the soil by no means fertile. The most important crop is flax, the culture of which is almost universal. A great part of the land is devoted to pasture, and great numbers of cattle are reared. The minerals include brown coal, iron, slate, and salt. The principal manufactures are glass and porcelain. The inhabitants are almost all Lutherans. Capital, Rudolstadt. Pop. (1905) 96,835.

Schwarzburg-Sondershausen, a German principality on the N. side of the Thuringian Forest, between the territories of Prussian Saxony and the Saxon duchies, and consisting of several distinct portions; area, 332 square miles. It is more fertile than Schwarzburg-Rudolstadt, producing corn for export. One of the principal sources of revenue is derived from the forests, which furnish excellent timber. Flax also is extensively cultivated, and great numbers of cattle, sheep, and swine are reared. The only manufacture of any importance is porcelain. The inhabitants are almost all Lutherans. The capital is Sondershausen. Pop. (1905) 85,152.

Schwarzenberg, a princely family of Germany, the head of which was raised (1429) by the Emperor Sigismund to the dignity of Baron of the Empire. Three of this family have acquired a European reputation. ADAM, Count of Schwarzenberg, born in 1584, became (1619) prime minister and adviser of George William, Elector of Brandenburg. He was all powerful during the Thirty Years' War, and brought down terrible calamities on Brandenburg by his obstinate refusal to join the Protestant union and his firm adherence to a policy of neutrality. He died March 14, 1641, shortly after the death of his master. KARL PHILIPP, Prince of Schwarzenberg; born in Vienna, April 15, 1771, and first served against the Turks. In the war against the French republic he fought with especial honor at the battles of Cateau-Cambrésis (1794), Würzburg (1796), and Hohenlinden (1800), and reached the grade of lieutenant field marshal. He was under the orders of Mack in the campaign of 1805; and when he saw that Ulm was lost he cut his way through the French army and retired to Eger. He was ambassador at the Russian court in 1808 by the express wish of the Emperor Alexander, fought at Wagram in 1809, and conducted the negotiations for the marriage between Napoleon and Maria Louisa. In this capacity and as ambassador at Paris he so far gained the esteem of Napoleon that the latter expressly demanded him as General-in-Chief of the Austrian contingent which was sent to aid France in the invasion of Russia in 1812. Schwarzenburg passed the Bug and achieved some slight successes, but was driven into the "duchy of Warsaw," where, acting on secret instructions from Napoleon, he took up a position at Pultusk and remained inactive. In the following year he was appointed to the command of the Austrian army of observation in Bohemia; and, when Austria joined the allied powers he became generalissimo of the united armies and won the great battles of Dresden and Leipsic. The year after (1814) he marched into France and captured Paris. He died of apoplexy in Leipsic, Oct. 15, 1820. His nephew, FELIX LUDWIG JOHANN FRIEDRICH, born Oct. 2, 1800, was sent on a diplomatic mission to London in 1826, was ambassador at Naples in 1846, distinguished himself in the Italian campaign of 1848, was placed at the head of affairs at Vienna, called in the aid of the Russians against Hungary, and pursued a bold absolutist policy, his object being to make Austria supreme among the German states. He died in Vienna, April 5, 1852.

Schwatka, Frederick, an American Arctic explorer; born in Galena, Ill., Sept. 29, 1849; was graduated at the United States Military Academy in 1871, and served as a lieutenant of cavalry on the frontier till 1877, meanwhile being also admitted to the Nebraska bar and taking a medical degree in New York. In 1878–1880 he commanded an expedition to King William's Land which discovered and buried the skeletons of several of Sir John Franklin's party, and gathered information which filled up all gaps in the narratives of Rae and McClintock, besides performing a notable sledge journey of 3,251 miles. After exploring the course of the Yukon in Alaska, in 1884 he resigned his commission. In 1886 he commanded the New York "Times" Alaskan expedition, and ascended Mount St. Elias to a height of 7,200 feet; in 1891 he led another party to Alaska which opened up some 700 miles of new country in the same quarter; and in 1889 he led an expedition, for the journal "America," into Chihuahua, in Northern Mexico. He published "Along Alaska's Great River" (1885); "Nimrod in the North" (1885); "The Children of the Cold" (1886); etc. He died in Portland, Or., Nov. 2, 1892.

Schwegler, Albert, a German philosopher; born in Michelbach, Würtemberg, Feb. 10, 1819. His best-known work is his "History of Philosophy" (1848; 11th ed. 1882). It has been translated into most European languages; into English by J. H. Seelye in America (1856), and by J. H. Stirling in England (1867). His "History of Greek Philosophy" was published in 1859. He died in Tübingen, Jan. 5, 1857.

Schweidnitz, a town of Prussia, in Silesia, on a height above the Weistritz, 29 miles S. W. of Breslau. Its manufactures include machinery, woolens, linens, furniture, earthenware, carriages, gloves, beer, and spirits. It was made a regular fortress by Frederick the Great, and figured much during his wars. During its last siege, in 1807, it was taken in 36 days by the French, and its outworks were dismantled. Its fortifications were removed in 1864. Pop. (1900) 28,439.

Schweinfurt, an ancient and long an imperial free city in Bavaria; on the Main, 28 miles N. E. of Würzsburg. It contains a beautiful market place, in which important cattle and wool markets are held. Wine growing, sugar refining, and manufactures of chemicals, paper, bells, dyeing materials, as white lead, ultramarine, Schweinfurt green, etc., and numerous other articles are carried on. Rückert, the poet, was born here; and a monument was erected in 1890.

Schweinfurth, Georg August, a Russian explorer; born in Riga, Russia, Dec. 29, 1836. He studied at Heidelberg, Munich, and Berlin. He investigated the flora and fauna of the valley of the Nile (1864–1866), and is the author of "Nile Vegetation" (1862); "Contribution to the Flora of Ethiopia" (1867); "Reliquiæ Kotsch-

yaræ" (1868); "In the Heart of Africa" (2 vols. 1874); "African Arts" etc.

Schweinitz, Lewis Davis von, an American botanist; born in Bethlehem, Pa., Feb. 13, 1780; was educated in Germany in 1798–1812; spent all his time from childhood in the study of botany. His original researches resulted in an addition of over 1,400 new species to the catalogue of American flora. Of these more than 1,200 were fungi, which prior to his time had been little studied. In his honor a new genus of plant was named *Schweinitzia*. He was offered the presidency of the University of North Carolina, but declined. His best known works include "Conspectus Fungorum Lusatiæ" (1805); "Synopsis Fungorum Carolinæ Superioris" (1818); "Specimen Floræ Americæ Septentrionalis Cryptogamieæ" (1821); "Monograph of the American Species of the Germs Viola" (1821); "Synopsis Fungorum in America Boreali Media Degentium" (1832); etc. He bequeathed his large and valuable collection of plants to the Academy of Natural Science of Philadelphia. He died in Bethlehem, Pa., Feb. 8, 1834.

Schwenkfeld, Caspar von, a German reformer; born of noble family, in Ossig, Lower Silesia, in 1490; studied two years at Cologne and elsewhere, and, before retiring into private life in 1521 to a constant study of the Scriptures, served at various courts with Duke Charles of Münsterberg, and as aulic counsellor with Duke Frederick II. of Liegnitz. He became acquainted with the views of John Huss, from his youth up had been a student of Tauler, and was permanently won over to the Reformation by the noble courage of Luther at Worms. About 1525 he openly declared for Luther, and went to Wittenberg to converse with him, but found his views widely divergent on baptism and the eucharist. Still further, he found himself unable to accept any confessions of faith except such as followed closely the letter of Scripture, and in his profound conviction that the new movement should proceed from within outwardly, and not from without inwardly, he disagreed with the Lutherans in their policy of linking the Reformed Church with the state instead of waiting passively for the direct guidance of the Holy Spirit, the sole fountain of sanctification. Schwenkfeld did not himself partake of the Lord's Supper, though he did not forbid it to others, for he held that there could be no right participation without the exclusion of unbelievers, and that the true Lord's Supper is kept through faith inwardly in the soul as often as a man receives "divine sweetness in Christ." He did not approve of infant baptism, yet without admitting the Baptist view of the importance of the baptism of adults. His views coincide with those of George Fox in the doctrine of the Inward Light, the Immediate Revelation, and the inability of mere outward bodily acts, such as partaking of the Lord's Supper or baptism, to give the inward and spiritual reality and power of the Lord's "body" and "blood," or that of the spiritual "washing of regeneration."

Schwenkfeld's views in that intolerant time brought him the hatred of the Lutherans and Catholics alike. The influence of the Emperor Ferdinand forced the Duke of Liegnitz to banish him in 1529, and he thereafter traveled to Ulm, Augsburg, Nuremberg, and Strasburg, everywhere gaining disciples. Luther fiercely denounced him, and many untrue charges were brought against him by others, but all the violence of his antagonists the much-enduring man received with saintly patience. He died in Ulm, Dec. 10, 1561. Schwenkfeld wrote 90 distinct works, most of which were burned, if not answered, by both Protestants and Catholics. By means of personal teaching and his books a group of earnest disciples more than 4,000 strong was formed all over Germany, but mostly in Swabia and Silesia, who separated themselves under the name of Confessors, or Followers of the Glory of Christ. They were persecuted in Silesia in his lifetime, and many emigrated to Holland, some to England. The Jesuit mission established in Silesia in 1719 persecuted the remnant still further, and some joined the Protestant churches, some fled to Saxony, where they were protected by Count Zinzendorf. In 1734 40 families emigrated to England, and finally thence to Pennsylvania, where, as Schwenkfeldians, they have maintained a distinct existence to this day.

Schwyz, a central canton of Switzerland, bounded on the N. by the Lake of Zürich and canton of St. Gall, W. by Zug and Luzern, S. by Lake Luzern, and E. by Glarus; area, 353 square miles. It belongs to the so-called mountain cantons, being traversed in all directions by lofty hills, including the Mythen, the Rigi, the Rossberg, the Drusberg, etc. The whole canton belongs to the basin of the Rhine, more than two-thirds of the surface being drained by the Sihl and the Lake of Zürich; a third, by the Lake of Luzern, chiefly by means of the Muotta; and the remainder, forming only an unimportant portion, by the Lake of Zug. The chief industry is the rearing of cattle, sheep, and swine. The canton is very poor in minerals. Manufactures are almost confined to some cotton and silk spinning and weaving. Schwyz being the most important of the cantons which first threw off the yoke of Austria, gave the name to the whole confederation. Its present government is an extreme democracy, the whole power, legislative and executive, being lodged in the male population of legal age, who hold a

general assembly every two years. The great body of the inhabitants are Roman Catholics. Pop. (1905) 57,324. Schwyz, the capital, is a straggling and picturesque town at the foot of the Mythen, about 1,680 feet above the sea, with a handsome parish church and an interesting town hall.

Sciacca, a seaport of Sicily; on a cliff 30 miles N. W. of Girgenti; has a fine 11th-century cathedral, the ruined castles of the Lunas and the Perollos (between whom there existed a terrible feud), hot sulphurous and saline springs, and half way up the adjacent mountain San Calogero caves that have been used as steam baths since Phœnician times. Off the coast very productive coral banks were discovered in 1875–1880. Agathocles, tyrant of Syracuse, was a native.

Sciæna, in ichthyology, the typical genus of the family *Sciænidæ*. Upper jaw overlapping, or equal to the lower; cleft of the mouth horizontal, or nearly so; no barbel. About 50 species are known, approximately with the range of the family. *Sciæna aquila* is the Maigre. Some of the species — as *S. nigra,* from the Mediterranean, and *S. richardsonii,* from Lake Huron — have the second ray very strong, and are sometimes made a separate genus, *Corvina.*

Sciænidæ, in ichthyology, the sole family of the division Sciæniformes, with 13 genera, from the tropical and sub-tropical coasts of the Atlantic and Indian Oceans. Body rather elongate, compressed, covered with ctenoid scales; lateral line continuous; teeth in villiform bands; palate toothless; stomach cæcal; the air-bladder frequently with numerous appendages. Many attain a large size, and nearly all are eaten.

Sciatica, acute pain produced by neuralgia following the course of the great sciatic nerve, generally in only one limb. It extends from the sciatic notch down the posterior surface of the thigh to the poplitcal space, or even to the foot, and arises from pressure on the nerve by intestinal accumulations, or from tumors, inflammation, overfatigue, exposure to cold and wet, or rheumatism. There are often nocturnal exacerbations of pain. It is most common from 50 to 60 years of age, and may continue for weeks or months. Electricity has been successfully employed.

Science, in its widest significance, the correlation of all knowledge. To know a truth in its relation to other truths is to know it scientifically. For example, the recognition that the alternation of day and night depends on the apparent daily motion of the sun is a distinct scientific achievement, being one of those elementary scientific truths which have been the possession of thinking minds from time immemorial. By generalization from everyday experiences like that just mentioned, and from the historic or traditional experiences of the race, man has been led to the belief that natural events follow each other in an orderly and connected way. To investigate this orderly connection is the aim of all science; and in pursuing this aim the human mind consciously or unconsciously takes for granted the law of continuity, which postulates that in their development and interactions the phenomena of nature follow an intelligible plan which never has failed and which never can fail. In assuming intelligibility in nature science rests of necessity on the fundamental laws of thought. To express it otherwise, the end of science is the rational interpretation of the facts of existence as disclosed to us by our faculties and senses.

In all scientific inquiry the first step is to scrutinize the evidence of the senses, whose indications are always imperfect and often misleading. History shows again and again that the supposed scientific beliefs of one age are at variance with the scientific facts of a later age. In every such case it will be found that the earlier and false science has laid too great stress on the apparent, and has from insufficient knowledge failed in apprehending the real. In the history of astronomy, the most self contained and in itself the most developed of the physical sciences, we find many familiar illustrations of this. None is more striking perhaps than the recognition of the earth's diurnal rotation as the reality which produces the appearance of the daily motion of sun, moon, and stars. At first a heresy, then a rational hypothesis commanding assent from all thinking minds, the earth's axial rotation is now a demonstrable fact.

The scientific method is essentially inductive, *i. e.,* from particulars to generalities and is to be contrasted with the method of philosophy which is deductive, *i. e.,* from general truths to particular truths. This distinction was first clearly indicated by Francis Bacon and elaborated by Descartes and Comte. No better instance of pure and extensive scientific research can be cited than that pursued by Darwin in his biological investigations.

Experiment is the great aid to scientific inquiry. In it we arbitrarily interfere with the circumstances of a phenomenon, or produce an entirely new phenomenon by an appropriate combination of causes. Contrasted with experiment is observation, in which we simply watch and record the events as they occur in nature. But even in astronomy, emphatically an observational science, experiment plays an important part. The dynamical knowledge which Newton developed into the cosmic law of gravitation was founded on experiment; and every time the astronomer points his telescope to a celestial object he experiments by arbitrarily interfering with the course of the rays of

Science

light. Meteorology again, which 20 years ago could hardly be called a science, has made great strides in these days by appealing to laboratory experiments for the elucidation of its phenomena. Likewise in biology very little true scientific progress was made till experiment was appealed to. Till then botany and zoölogy were simply lists of plants and animals, classified according to characteristics or according to distribution on the earth's surface. The gardener and breeder led the way in a form of experimenting which Darwin made scientific; while such branches of the subject as embryology and bacteriology are as truly experimental as chemistry itself. In studying the laws alike of inorganic and of organic nature the experimenter must be careful not to destroy the phenomenon that is to be studied. This consideration makes the biological problem particularly difficult of attack.

In the psychical group of sciences the method of experimenting still awaits development. The complexity of the problems presented, and the manner in which they affect the welfare and happiness of humanity, render social and political experimenting excessively hazardous. History, however, affords many instructive examples of attempted reforms which were largely tentative. From these and from the general study of customs and rites as they have been in the past and are now, the economist, the ethnologist, the moralist, or the theologian can accumulate his own materials for the upbuilding of his appropriate science. Such sciences are of necessity essentially observational.

It is obvious from what has gone before that sciences may be grouped, or science partitioned, on a broad and intelligible principle. There are the physical sciences, which have to do with inorganic nature — *i. e.*, with the laws and properties of matter, energy, and ether. Then there are the biological sciences, which consider the laws of life. And finally there the psychical sciences, which deal with the phenomena of mind. The influence of life on the matter and energy of the universe, profound though it is, in no way renders nugatory the great principles that hold in inorganic nature. These principles are the conservation of matter and the conservation of energy, ether being the medium through which and by which energy is transmitted and transformed. The great principle of biology, which enters along with these physical principles as a factor in organic nature, is the law of biogenesis, or life from life. In the higher mental sphere of activities these three great principles still hold, however much mind may interfere in what would otherwise have been the natural progress of events in the lower spheres of activity. So far no broad psychic principle comparable to the physical and biological principles has been discovered, or even imagined to be discoverable. It must ever be remembered, however, that this broad gradation in the sciences is itself a psychic phenomenon.

Numerous attempts have been made to give a detailed classification of the sciences, so as to bring out the natural relation of the one to the other. Such classifications may have a historic interest, inasmuch as they must have been largely conditioned by the extent of knowledge or degree of ignorance of the classifier. They may also have a philosophic value as affording a glimpse into the nature of the human mind. But it is extremely doubtful if they have in any appreciable way assisted in the progress of science itself. One of the most celebrated is the classification due to Comte, who first explicitly drew the distinction between abstract and concrete sciences, or what might better be termed fundamental and derivative sciences (see POSITIVISM). The distinction is most simply expressed by saying that a derivative science requires for its elucidation no peculiar principle or law of nature, but involves only those principles which are already discussed under the fundamental sciences. The truth is that a derivative science is a special or limited branch of science in general, separated out for purposes more or less concrete or practical; and it is impossible logically to mark off such special sciences as a group from other branches of science, which, though no more abstract and no less special, are still treated as included in the fundamental sciences. The mistake which Comte himself made in classifying astronomy in his group of abstract sciences along with mathematics, physics, chemistry, biology, and sociology is an illustration in point. Comte's scheme has been severely criticized by Herbert Spencer, who suggests a threefold grouping into abstract, abstract-concrete, and concrete sciences. The second group is essentially what we have called above physical science, including physics and chemistry as ordinarily understood. Mr. Spencer considers it as dealing with the laws of "force" in the abstract, or as exhibited by matter. Biology appears for the first time in the third or concrete group as exhibiting certain "laws of redistribution of matter and motion actually going on." But surely there is a fundamental science of biology dealing with the laws of vital "force," and having to botany and zoölogy the same kind of relation which physics and chemistry have to astronomy and geology. The whole fallacy of the position lies in making "force," even with its vague Spencerian sense, one of the central props of the argument. Force is apparent, not real, unless we take it in the sense of energy; but this will not apply to Mr. Spencer's classification. From the present outlook of science the existences of the universe are five — namely, ether, matter,

Science

energy, life, and mind. The first three are inseparable agents in the simplest phenomenon that occurs in nature. They may ultimately be reduced to two or conceivably to one.

Science, Great Men in. How shall we determine that men are great? Who, for instance, shall we say, are the great men of science? The men who have made the great and fruitful discoveries? Such discoveries in the 19th century were mostly made independently by two or more persons. Darwin and Wallace simultaneously put forth the hypothesis of natural selection. Clausius, Rankine, and Sadi Carnot, perhaps Kelvin, worked out the mechanical theory of heat. Krönig, Clausius, Joule, Herapath, Waterston, and Daniel Bernouilli independently suggested the kinetical theory of gases. I do not know how many minds besides Robert Mayer, Colding, Joule, and Helmholtz hit upon the doctrine of the conservation of energy. Faraday and Joseph Henry brought magneto-electricity to light. The pack of writers who were on the warm scent of the periodic law of the chemical elements approached 200 when the discovery itself, a most difficult inference, was partly achieved by Lothar Meyer, wholly by Mendeléef. When great discoveries were thus in the air, shall that brain necessarily be deemed great upon which they happened earliest to condense, or the man supereminent who, by the unmeaning rule of priority of publication, gets the credit in brief statements? No, this method of estimation, natural as it is to make success the standard of measure, will not do.

Shall we, then, by a logical analysis draw up an abstract definition of greatness, and call those men great who conform to it? If there were no dispute about the nature of greatness, this might probably prove the most convenient plan. It would be like a rule of grammar adduced to decide whether a phrase is good English or not. Nor would the circumstance that the definition could not be as explicit and determinate as a rule of grammar constitute a serious difficulty. Unfortunately, however, among the few writers who have seriously studied the question, the most extreme differences prevail as to the nature of great men. Some hold that they are fashioned of the most ordinary clay, and that only their rearing and environment, conjoined with fortunate opportunities, make them what they are. The heaviest weight, intellectually, among these writers maintains, on the other hand, that circumstances are as powerless to suppress the great man as they would be to subject a human being to a nation of dogs. But it was only the blundering Malvolio who got the notion that some are born great; the sentence of the astute Maria was: "Some are become great, some atcheeves greatnesse, and some have greatnesse thrust uppon em." Amid this difference of opinion, any definition of greatness would be like a disputed rule of grammar. Just as a rule of grammar does not render an expression poor English, but only generalizes the fact that good writers do not use it, so, in order to establish a definition of greatness, it would be necessary to begin by ascertaining what men were, and what men were not, great; and, that having been done, the rule might as well have been dispensed with. My opinion will, I fear, be set down by some intellectual men as foolishness, though it has not been lightly formed, nor without long years of experimentation, — that the way to judge of whether a man was great or not is to put aside all analysis, to contemplate attentively his life and works, and then to look into one's heart and estimate the impression one finds to have been made. This is the way in which one would decide whether a mountain were sublime or not. The great man is the impressive personality; and the question whether he is great is a question of impression.

The subject admits of much interesting discussion, but the pertinent point here is to confess that the judgments herein expressed have been formed in this way; and if I make general remarks about the great men of the century, these are not deductions from any preconceived principles, but are simply inductions from such pure æsthetic estimations. Though I call them æsthetic, and, no doubt, the "subjective," or personal, factor in them is considerable (but it is, indeed, quite impossible to determine how far they are "objective," that is, representative of the ultimate judgment of posterity), yet I think I am warranted in saying that I have ascertained that a large majority of the educated Americans of the present day would, if thoroughly trained in the practice of this delicate method of pure æsthetic estimation, reach judgments about great men which, if based on the same information, would show a degree of concordance that would surprise most people not a little.

The glory of the 19th century has been its science; and its scientific great men are those whom I mean here to consider. Their distinctive characteristic throughout the century, and more and more so in each succeeding generation, has been devotion to the pursuit of truth for truth's sake. In this century we have not heard a Franklin asking, "What signifies a philosophy which does not apply itself to some use?" — a remark that could be paralleled by utterances of Laplace, of Rumford, of Buffon, and of many another well-qualified spokesman of 18th-century science.

Science

It was in the early dawn of the 19th that Gauss (or was it Dirichlet?) gave as the reason of his passion for the Theory of Numbers that "it is a pure virgin that never has been, and never can be, prostituted to any practical application whatsoever." It was my inestimable privilege to have felt as a boy the warmth of the steadily burning enthusiasm of the scientific generation of Darwin, most of the leaders of which at home I knew intimately, and some very well in almost every country of Europe. I particularize that generation without having any reason to suspect that that flame has since burned dimmer or less purely, but simply because if a word belonged to one's mother tongue, one may be supposed to know unerringly the meaning the teachers of one's boyhood attached to it.

The word science was one often in those men's mouths, and I am quite sure they did not mean by it "systematized knowledge," as former ages had defined it, nor anything set down in a book, but, on the contrary, a mode of life; not knowledge, but the devoted, well-considered life pursuit of knowledge; devotion to truth —not "devotion to truth as one sees it," for that is no devotion to truth at all, but only to party — no, far from that, devotion to the truth that the man is not yet able to see but is striving to obtain. The word was thus, from the etymological point of view, already a misnomer. And so it remains with the scientists of today. What they meant, and still mean, by "science" ought, etymologically, to be called philosophy. But during the 19th century it was only a metaphysical professor of a now obsolescent type, as I hope, who could sit in his academic chair, puffed up with his "systematized knowledge," — no true philosopher but a mere philodoxer. For a snapshot at the 19th-century man of science, one may take Sir Humphry Davy, willing, as early as 1818, seriously to investigate the liquefaction of the blood of St. Januarius; or John Tyndall, with scientific ingenuousness proposing that prayer test to which no clerical Elijah has yet been found with the faith and good will to respond; or William Crookes, devoting years of his magnificent powers to examining the supposed evidences of the direct action of mind upon matter, in the face of the world's scorn. Contrast these instances with the refusal of Laplace and Biot, in the closing years of the previous century, to accept the evidence that stones fall from heaven (evidence proving that they do so daily), simply because their prepossessions were the other way. One of the geologist brothers De Luc declared that he would not believe such a thing though he saw it with his own eyes; and a scientifically given English ecclesiastic, who happened to be sojourning in Siena when a shower of aërolites was dashed in broad daylight into an open square of that town, wrote home that having seen the stones he had found the testimony of eyewitnesses so unimpeachable, and so trustworthy that — that he accepted the fact, you will say? by no means — that he knew not what to think! Such was the *bon sens* that guided the 18th century,— a pretty phrase for ineradicable prejudice.

To this self-effacement before the grandeur of reason and truth, is traceable the greatness of 19th-century science, most obviously in mathematics. In the minds of 18th-century mathematicians their science existed for the sake of its applications. Forgetfulness of this was in their eyes reprehensible, immoral. The question was, What would a given piece of mathematics do? They liked smooth running and elegant machinery — there was economy in that; but they were not sedulous that it should have symmetry; idle admiration of its beauty they hardly approved. If it was excessively complicated and intricate, that was regarded rather as a feature to be proud of than as a blemish. Were the complete revolution that the 19th century wrought upon the ideal of mathematics not notorious, one could soon convince himself of it by looking over almost any modern treatise — say, Salmon on higher plane curves. That volume, for example, would be found replete with theorems hardly any of which hold good for any curves that could really exist. Realizable curves have hardly been studied at all, for the reason that they do not yield a beautiful theory such as is now exacted. Modern mathematics is highly artistic. A simple theme is chosen, some conception pretty and charming in itself. Then it is shown that by simply holding this idea up to one's eye and looking through it, a whole forest that before seemed a thick and tangled jungle of bushes and briers is seen to be in reality an orderly garden. The word generalization really cannot be fully understood without studying modern mathematics; nor can the beauty of generalization be in any other way so well appreciated. There is here no need of throwing out "extreme cases." Far from that, it is precisely in the extreme cases that the power and beauty of the magic eyeglass is most apparent and most marvelous. Let me take back the word "magic," though; for the reasonableness of it is just its crowning charm. I must not be led away from my point to expatiate on the reposefulness of the new mathematics, on how it relieves us of that tiresome imp, Man, and from the most importunate and unsatisfactory of the race, one's self. Suffice it to say that it is so reasonable, so simple, so easy to read, when the right view has once been attained, that the student may easily forget what arduous labors

Science

were expended in constructing the first convenient pathway to that lofty summit; what mastery over intricacies, far beyond that of the 18th-century master. "It must not be supposed," said C. G. J. Jacobi, one of the simplifying pioneers, "that it is to a gift of nature that I owe such mathematical power as I possess. No, it has come by hard work, hard work. Not mere industry, but brain-splitting thinking—hard work; hard work that has often endangered my health." Such reflections enable us to perceive that if modern mathematics is great, so also were the men who made it great.

The science next in abstractness after mathematics is logic. The contributions of the 18th century to this subject were enormous. In pure logic, the doctrine of chances, which has been the logical guide of the exact sciences and is now illuminating the pathway of the theory of evolution, and is destined to still higher uses, received at the hands of Jacob Bernouilli and of Laplace developments of the first importance. In the theory of cognition, Berkeley and Kant laid solid foundations; their personal greatness is incontestable. This is hardly true of Hume. In the 19th century, Boole created a method of miraculous fruitfulness, which aided in the development of the logic of relatives, and threw great light on the doctrine of probability, and thereby upon the theory and rules of inductive reasoning. De Morgan added an entirely new kind of syllogism, and brought the logic of relatives into existence, which revolutionizes general conceptions of reasoning. The works of Comte, Whewell, J. S. Mill, Jevons, and others upon the philosophy of inductive science were less successful or fruitful. In the more metaphysical part of logic, the philosophy of Hegel, though it cannot be accepted on the whole, was the work of a great man. In metaphysics and general cosmology, the attitude of the century has been expectant. Herbert Spencer has been proclaimed as a sort of scientific Messiah by a group of followers more ardent than philosophic, which does not seem to be gathering strength.

At the head of the physical sciences stands nomological physics. Dr. Thomas Young was here the earliest great man of the century, whose intellect illuminated every corner to which it was directed, taking the first difficult steps in the decipherment of the hieroglyphics, originating the doctrine of color-mixtures, propounding the correct theory of light and illuminative everywhere. It gives a realizing sense of the century's progress that this great man in its early years should have opined that experimentation in general had then been pushed about far enough. On that occasion, it was not his usual logic, but the 18th-century watchword "*de bon sens*," that was his guide, with the sort of result it is continually turning out when used beyond its proper sphere of everyday practical affairs. The advance of years with their experience has led physicists to expend more and vastly more effort on extreme precision, against every protest of good sense. What has come of it? Marconi's wireless telegraphy, for one thing. For it was the precision with which the velocity of light on the one hand, and the ratio of statical and dynamical constants of electricity on the other had been determined that proved to Maxwell that the vibrating medium of light was the substance of electricity, a theory that his great follower Hertz applied to making giant light-waves less affected by obstructions than even those of sound. I dare say sapient "good sense" pooh-poohs those wonderful new substances, helium and the rest, that seem the connecting link between ordinary matter and the ether. So it would be useless to point out that their discovery was entirely due to Lord Rayleigh's fastidiousness in the determination of the density of nitrogen. But it has to be noted as a characteristic of the great physicists of the 19th century that their reverence for every feature of the phenomenon, however minute, has been in thorough disaccord with the older "good sense." The greatest advances in physics during the century were made by several men at once. Certain ideas would come somehow to be in the air; and by the time they had crystallized for a student here and there, he would hesitate to announce as original conceptions what he had reason to suppose many men shared, while he knew that the larger body would not be yet ready to accept them. Under those circumstances, priority of publication can signify nothing except haste. Yet, when we come to apply the method of pure æsthetic estimation to the different thinkers who first brought out the mechanical theory of heat, the kinetical theory of gases, and the doctrine of the conservation of energy, we find to our surprise, not that they were none of them great, but that a remarkable crop of great men made its appearance to work out those problems, a fact only explicable by the forest tree theory. I mean by that, the theory that such an enormous majority of men capable of developing into greatness are kept down by extraneous circumstances, like trees in a forest, that wherever there is room for them they are sure to appear.

Of all men of the century Faraday had the greatest power of drawing ideas straight out of his experiments and making his physical apparatus do his thinking, so that experimentation and inference were not two proceedings, but one. To understand what this means, read "Researches on Electricity." His genius was thus higher than that of

Helmholtz, who fitted a phenomenon with an appropriate conception out of his store, as one might fit a bottle with a stopper. The most wonderful capacity for "catching on" to the ideas of nature when these were of a complicated kind was shown by Mendeléef in making out the periodic law of the chemical elements, as one might make out the meaning of a pantomime, from data so fragmentary — and in some cases erroneous — that the interpretation involved the correction of sundry facts, corrections since confirmed, as well as the prediction of the very peculiar properties of the unknown gallium, scandium, germanium, which were soon afterward actually met with. Minute examination of all his utterances convinces one that Mendeléef's mental processes in this unparalleled induction were largely subconscious, and indicate an absorption of the man's whole being in his devotion to the reason in facts.

A great naturalist, as well as I can make out, is a man whose capacious skull allows of his being on the alert to a hundred different things at once, this same alertness being connected with a power of seeing the relations between different complicated sets of phenomena when they are presented in their entirety. The 18th century had its Linnæus, whose greatness even I can detect as I turn over his pages; its Huber, discovering through others' eyes what others could not discern with their own; its Goethe, its Haller, its Hunter; and, mixed with practical greatness, its Pinel and its Jenner. Then there was Lavater, who showed how pure æsthetic estimation might be turned to the discovery of truth, — a man depreciated because logicians and philodoxers can so much more easily detect his weakness than discern his strength. The 19th century, with its great thinker Darwin, its Pasteur (great in chemistry as well as in biology, a man who impressed me personally, and impresses me in his works as much as any but two or three of the century), its Lamaroll, Weissmann, Cuvier, Agassiz, Von Baer, Bichat, Johannes Müller, Robert Brown, has certainly garnered a magnificent harvest of great men from this field.

Those sciences which study individual objects and seek to explain them on physical principles — astronomy, geology, etc. (corresponding to history and biography on the psychical side) — demand the greatest assemblage of different powers. Those who pursue them have first to be mathematicians physicists, chemists, naturalists, all at once, and after that astronomers or geologists in addition. It is almost beyond human power. In the 18th century A. G. Werner broke ground in geology, William Herschel, Kant, and Laplace did great things in astronomy. In the 19th century geology was first really made a science, and among its great men one recalls at once Lyell, Agassiz, Kelvin. This country has become its home. In astronomy, too this country has been eminent, especially in the new astronomy which has afforded the needed scope for greatness, instead of the narrow rut that Bessel and Argelander had left behind them. Thus it happens that we have a magnificent group of great astronomers living among us today. We stand too close to them to take in their true proportions, but it is certain that the names of Chandler, Langley, Newcomb, Pickering, and several others are indelibly inscribed on the heavens. In England it is only recently that Sir Norman Lockyer has brought the extraordinary research, to which his life has been devoted, to completion, so far as such work can be said to be capable of completion. It is an attribute of its greatness that it is endless.

When we compare all the men I have glanced at, with a view to eliciting a common trait somewhat distinctive of the 19th century, we cannot but see that science has been animated by a new spirit, till the very word has become a misnomer. It is the man of science, eager to have his every opinion regenerated, his every idea rationalized, by drinking at the fountain of fact and devoting all the energies of his life to the cult of Truth, not as he understands it, but as he does not yet understand it, that ought properly to be called a philosopher. To an earlier age knowledge was power — merely that and nothing more; to us it is life and the *summum bonum*. Emancipation from the bonds of self, of one's own prepossessions, importunately sought at the hands of that rational power before which all must ultimately bow,—this is the characteristic that distinguishes all the great figures of 19th-century science from those of former periods. C. S. Peirce.

Scilly Islands, a group of islands belonging to Cornwall, England; about 27 miles W. S. W. of Land's End. They occupy about 30 square miles of sea room, and consist of six large islands — St. Mary's (1,528 acres), Tresco (697 acres), St. Martin's (515 acres), St. Agnes (313 acres), Bryher (269 acres), and Samson (78 acres) — and some 30 small ones, besides innumerable rocks and ledges, of which about 100 are named. They are composed entirely of a coarse type of granite, a continuation of that running through Devon and Cornwall. Tin is found, but in such minute quantities that to justify the identification of these islands with the Cassiterides or "Tin Islands" of the ancients the W. end of Cornwall would almost require to be included as the all-important member of the group. The idea of a land of Lyonesse between the islands and the mainland submerged within historic times is now abandoned. The present name Scilly belongs strictly to a small,

very inaccessible, double, rocky island in the N. W. of the group.

Athelstan conquered the islands in 938, and established monks on Tresco, the ruins of whose abbey still remain. Olaf Trygvason (995–1000), who forced Christianity on Norway and introduced it into Iceland, is said to have been converted by a hermit on one of the islands. They were handed over to the wealthy abbey of Tavistock by Henry I., but reverted to the crown upon the dissolution of the monasteries in 1539. In 1568 Queen Elizabeth leased them to Sir Francis Godolphin, who built the Star Castle on St. Mary's — over the doorway stands "E. R., 1593." They remained in his family for more than 250 years — hence the hamlet of "Dolphin" town on Tresco. They sheltered Prince Charles in 1645 before he fled to Jersey, and Cromwell's Tower on Tresco was set up by the Parliamentary forces. In 1834 they were leased to Augustus John Smith, a radical reformer though somewhat of an autocrat, and the best friend the islanders have ever had. He made Tresco his home for 38 years, and his tropical gardens there are unique in Northern Europe. He built churches and schools, suppressed smuggling, encouraged agriculture, and forbade overcrowded holdings. He was succeeded as "lord proprietor" in 1872 by his nephew, T. A. Dorrien Smith.

The climate is mild, but necessarily damp, and the weather is changeable and frequently stormy; but the temperature is extremely equable, averaging 58° F. in summer and 45° F. in winter. The leading natural features of the scenery are the fantastically weathered rocks and rock basins and the bold coast lines. There are remains of cromlechs and stone circles; and a perfect kistvaen (containing human bones showing traces of fire action) was opened on Samson in 1862. Tresco Abbey and its gardens are considered the leading objects of interest for the tourist. No part of the islands is more than 160 feet above sea-level. The highest points are the "Telegraph" on St. Mary's, and St. Martin's Head, which has had a daymark since 1683. There has been a lighthouse on St. Agnes since 1680, on Bishop Rock since 1858, and on Rock Island since 1887; there are also lights on the Wolf, the Seven Stones (floating), and the Longships off Land's End. Hugh Town on St. Mary's, the only town on the islands, with plain, substantial and uninteresting houses (mostly two-storied), has a church (resident chaplain, with curates on Tresco, St. Martin's, and St. Agnes), two chapels, two comfortable hotels, banks, shops, schools, telegraph (since 1870), and Jubilee Hall. It has also a pier (erected by A. J. Smith), a coast guard station, and a lifeboat. There is good anchorage in the roadstead. Many of the islands, especially Annet, abound with sea fowl.

Wrecks used to be very numerous and were a fruitful source of wealth. One of the most famous was that of three ships of Sir Cloudesley Shovel's fleet in 1707, when 2,000 men, including the admiral, were drowned. The Scillonians also lived by pilotage, but steam and more lighthouses now help vessels to avoid the islands. Smuggling was formerly largely indulged in. In the early years of the 19th century, before the days of iron ships, there were three shipbuilding-yards on St. Mary's. Kelp making, introduced in 1684, has been given up. Nowadays most of the young men emigrate and are found doing well in all parts of the world. Farming is practised, and early potatoes and broccoli are exported; but the principal industry now is the cultivation of narcissus and other lilies — 100 tons of flowers being shipped in a single spring. In May and June, during the mackerel fishing, there is one steamer (often two) daily with cargoes of sometimes over 100,000 fish. The fishing boats, however, belong to Penzance and the E. coast. Politically the islands belong to the St. Ives division of Cornwall.

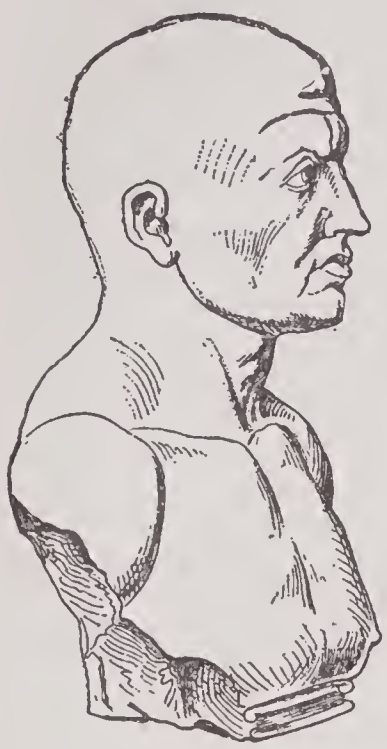
Scintillation, a twinkling of the stars; a familiar phenomenon to all who have directed their attention to the firmament above us. Under ordinary atmospheric conditions this flickering is possessed only by the so-called fixed stars. A planet shines steadily and by this mark can readily be picked out. When near the horizon, however, planets have been observed to scintillate slightly, while stars at low altitudes invariably twinkle more vigorously than stars overhead. Scintillation may be said to depend on three factors: (1) The vast distance even of the nearest stars reducing the largest of them to mere points of light. (2) The ever-changing variableness in condition of the atmosphere through which the light must come to us. (3) The smallness of aperture of our eye, which receives an almost ideal single ray of light.

Scio College, a coeducational institution in Scio, O., opened in 1857, under the auspices of the Methodist Episcopal Church; has grounds and buildings valued at over $50,000; volumes in the library, about 3,500; productive funds, $15,000; average number of faculty, 17; average student attendance, 310; graduates, over 2,300; ordinary income, $10,000.

Scioppius, properly KASPAR SCHOPPE, a German theological controversialist; born in Newmark, in the Palatinate, May 21, 1576. His best work is his "Philosophical Grammar." He died in Padua Nov. 19, 1649.

Scioto, a river of Ohio; general course, S.; length about 280 miles; flows into the Ohio river by a mouth 150 yards wide at Portsmouth. It is navigable for boats about 130 miles.

Scipio, Æmilianus Africanus (The Younger), Publius Cornelius, conqueror of Carthage; born about B. C. 185. He was the youngest son of Æmilius Paulus, and the adopted son of Publius Scipio, son of Africanus the elder. In his youth he had the advantage of the instructions and friendship of Polybius, who, exiled from Greece, was permitted to live in the house of Æmilius Paulus. He was an industrious student of literature, and early proved himself singularly free from the common vices of sensuality and covetousness. He began his military service in Spain in 151; gained great reputation soon after in Africa, in the third Punic War; and in 148, though not of fit age, was chosen consul. The next year, accompanied by Polybius and C. Lælius, he went to Africa, and at once commenced the siege of Carthage, which was heroically defended. It was entered by the Romans in the spring of 146; desperate fighting took place from street to street, and from house to house, with awful bloodshed; and at last a fire broke out that raged nearly a week. Scipio mused mournfully over these horrors, and foreboded like ruin for Rome. By order of the Senate the wall and houses were totally destroyed, and a curse pronounced against whoever should rebuild the city. Scipio had a magnificent triumph on his return. He led a simple and frugal life, and during his censorship, 142–141, tried to effect reforms in the manners of his countrymen, but without success. In 134 he was again consul, with Spain for his province; and his great achievement there was the siege and capture of Numantia, for which he had the surname Numantinus. His marriage with Sempronia, sister of the Gracchi, was not a happy one. By his bold resistance to the proposed reforms he lost the favor of the popular party; and at last, in 129, he was found dead in his bed. Suspicion of murder fell on various persons, but chiefly on Carbo, one of the most rash advocates of the Agrarian reforms.



SCIPIO THE YOUNGER.

Scipio, Africanus (The Elder), Publius Cornelius, one of the greatest of the Romans, born B. C. 234. He is said to have saved his father's life at the battle of the Ticinus, and by his courage and decision prevented the desertion of the young nobles after the defeat at Cannæ. At the age of 24 he was chosen to command, as pro-consul, in Spain, where, instead of risking a battle with the superior forces of the Carthaginians, he laid siege to the city of Carthago Nova and took it the same year. His humane and generous conduct on becoming master of the city, and especially his liberation of the Spanish hostages and prisoners found there, among them a very beautiful girl, excited the most enthusiastic admiration. He was even offered the sovereignty of Spain, but declined to be more than general of the Roman people. During the next three years Scipio made himself master of all Spain except the town of Gades. In order to prepare the way for the invasion of the Carthaginian territory he made a secret visit to the court of Syphax, King of Numidia, and won his alliance. In 206 he returned to Rome and was chosen consul for the next year. Sicily was given to him as his province, and having attracted by his character and success an army of volunteers, he crossed, in 204, into Africa, and began the siege of Utica, but on the approach of Hasdrubal retired into winter quarters. In the spring he burnt, by stratagem, the double camp of the enemy, and destroyed the fugitive forces. Syphax, who had joined Hasdrubal, was captured, and Cirta surrendered to the conquerors. Hannibal was called to oppose Scipio in Africa, and the second Punic War was terminated by the total defeat of Hannibal at the battle of Zama, Oct. 19, 202. Peace was signed the next year, and Scipio, on his return home, had the most splendid triumph which had yet been seen, and received the surname Africanus. He declined other honors which were offered him; was subsequently censor, consul a second time, and in 193 ambassador to Antiochus, King of Syria, at whose court he is said to have met Hannibal. Having accompanied his brother Lucius to the Syrian war as lieutenant in 190, they were accused of misappropriation of moneys received from Antiochus. Cato was the leader of the party opposed to Scipio, and the prosecution of Lucius was successful, but that of Africanus was dropped by the advice of Tiberius Gracchus. The popularity of Scipio had waned, and he left Rome never to return. He died at his villa, in Liternum, 183 B. C., the same year in which Hannibal died.

Scipio, Lucius Cornelius, surnamed Asiaticus, was brother of the preceding, with whom he served in Spain and Africa. He obtained the consulate in 190.

Scire facias, in law, a writ to enforce the execution of judgments, patents, or matters

of record, or to vacate, quash, or annul them. It is often abbreviated to *sci. fa.*

Scirpus, a genus of plants of the order *Cyperaceæ.* The plants of this genus are called club rushes, and the common bulrush (*S. lacustris*) of ponds and sluggish streams is a familiar example. The rhizomes of *S. dubius* are eaten by the natives of the S. of India; as are the tubers of *S. tuberosus* by the Chinese, who cultivate the plant in tanks and ponds. The species of this genus, about 300, are universally diffused, though found chiefly in temperate climates. They date from the Lower Miocene period.

Scirrhus. See CANCER.

Scissors and Shears, implements for cutting various substances. Scissors are made up of three parts, the blades, the bows, or rings to put the fingers in, and the shanks, or parts between the blades and the bows. The best scissors are made of cast steel, but some are made of shear steel, some partly of steel and partly of iron, and some of common cast-iron. The kinds most in use are made of shear steel, and have only the blades hardened. Large scissors, such as tailors' shears, have the blades only of steel, the bows and the shank being made of iron. Only the cheapest scissors are made of cast-iron. Scissors blades are forged in much the same way as knife blades. One blade is made at a time, and enough of the metal is cut off with it to form the shank and the bow. A hole is then punched through this metal large enough to let in the point of a small anvil, on which the bow is hammered into shape. The parts are then shaped better by filing, and the hole for the rivet is bored. The blades are next ground, and the bows and other parts are polished with emery and oil. The blades are then fitted together, the screw is put in, and the parts are made to work smoothly. The two parts are next bound round with fine iron wire, the screw is taken out, and the blades and shanks are hardened by heating them and cooling them quickly in water. After the wire is taken off the blades are ground again, fastened together, and made to work right, and lastly polished and finished.

A great many different kinds of scissors are made, such as cutting-out scissors, button-hole scissors, and other kinds used by women; scissors for cutting paper, hair, lace, and the nails; for trimming flowers, grape vines, and other shrubbery; for trimming horses and shearing sheep; and scissors and shears for the use of tailors, stationers, bankers, barbers, book binders, tinsmiths, iron workers, etc. The shears used for cutting tin, sheet iron, sheet copper, and other sheet metals are made with very strong blades, one of which is fixed tight, so that the upper handle may be used with both hands.

Another kind of shears works with a spring which keeps the blades always open. All the workman has to do is to close the blades together by shutting his hand, and every time he opens his hand the blades spring open again. Such shears are used for shearing sheep, clipping horses, foliage, etc. The blades of scissors and shears are not like knife blades, which are sharpened on both sides, but like chisels, which are sharpened on but one side; so scissors are really double chisels, the blades of which are made to move toward each other and cut whatever comes between them. In some machines the two blades are made round like wheels, which move toward each other, so that the edges shut close together and cut whatever is pushed against them. This makes an endless pair of scissors, for the blades never cease shutting together while the machine is working. Such shears are used by paper makers and other manufacturers.

The word scissors is from the Old English *sisourcs,* which is from the Latin *scindere, scissum,* to cut. Shears is from the Anglo-Saxon *sceran,* to cut off, to divide.

Scissors and Paste, an expression signifying hasty and indiscriminate compilation, as distinguished from original literary work. It is also used in the sense of printing previously published, as distinct from original matter. The expression probably originated in a newspaper office, where paragraphs are cut out from exchanges and pasted on pieces of paper to be sent to the compositors.

Scissor Bill, or **Skimmer,** the popular name of the genus *Rhynchops,* family *Laridæ,* including birds closely allied to the Terns, but easily distinguished by their singular bill, which is compressed like a knife, and has the lower mandible longer than the upper, and broken off, as it were, at the tip. The American species, *R. nigra* (the black skimmer), is 19 inches long; wing 14. It skims its food from the surface of the water.

Sclerodermata, in zoölogy, hexacorolla; a sub-order of *Zoantharia.* They possess a corallum partially or wholly developed within the tissues of the polypes themselves, not consisting of scattered spicules, the parts being generally disposed in multiples of six. The actinosoma may be simple (consisting of a single polype), or composite (consisting of many polypes united by a cœnosarc). The Sclerodermata are divided into four groups: Aporosa, Perforata, Tabulata, and Tubulosa. They attain their maximum development in warm seas.

Sclerodermi, in ichthyology, a family of *Plectognathi.* Snout somewhat produced; jaws armed with few distinct teeth; skin with scutes or rough; elements of a spinous dorsal and ventral generally present. They

are marine fishes of small size, very common in the tropics, but scarcer in higher latitudes. There are three groups: Triacanthina, Balistina, and Ostraciontina.

Sclerostoma, in zoölogy, a genus of *Strongylidæ*, of which family Cobbold makes *S. syngamus* (the parasite which causes gapes in fowls) the type. *S. duodenale* (*Dochmius anchylostomum*, or *Anchylostoma duodenale*), discovered by Dubeni in Milan in 1838, is a common endoparasite in man in Northern Italy, and is extremely abundant in Egypt. Pruner found it in nearly every corpse he examined. It is about a third of an inch long; the female is much larger and much more numerous than the male.

Scolecida, in zoölogy, Huxley's name for a class of Annuloida. Animals possessed of a water-vascular system, a set of vessels communicating with the exterior by means of one or more apertures situated upon the surface of the body, and branching out more or less extensively into its substance. It comprehends Cuvier's *Entozoa* and the free *Turbellaria*. Professor Huxley included under it the *Rotifera, Turbellaria, Trematoda, Tæniada, Nematoidea, Acanthocephala,* and *Gordiacea.*

Scollard, Clinton, an American poet; born in Clinton, N. Y., Sept. 18, 1861. In 1888 he was made assistant Professor of Rhetoric at Hamilton College, and later Professor of English Literature, resigning in 1896 to devote himself to literature. Among his publications are: "Pictures in Song" (1884); "With Reed and Lyre" (1886); "Old and New World Lyrics" (1888); "Giovio and Gilulia" (1891); "Songs of Sunrise Lands" (1892); an edition of Ford's "Broken Heart" (1895); "A Christmas Garland" (1897); "A Man at Arms" (1898); "Lawton" (1900); etc.

Scolopacidæ, in ornithology, a cosmopolitan family of *Grallæ*, comprising the snipes, sandpipers, curlews, and allied genera. The bill is long, very slender and flexible. They frequent bogs and marshes, or the banks of rivers and ditches, where they probe the ground for worms, insects, and testaceous mollusks. Wallace puts the genera at 21.

Scolopax, the typical genus of the family *Scolopacidæ*, with four species ranging over the Palæartic region to India, Java, and Australia. Beak long, straight, compressed; nostrils lateral, basal; legs rather short, tibia feathered nearly to joint; three toes before, almost entirely divided, one behind; wings moderate, first quill-feather longest; tail short, rounded. *S. rusticola* is the woodcock.

Scolopendra, in zoölogy, the centipede; the typical genus of *Scolopendridæ*. Legs 21 or more pairs; antennæ with 17 joints; eyes distinct, four on each side; the mandibles with a poisonous fluid injected into the wound when they bite. They shun the light, live under logs of wood, the bark of decayed trees, etc., run very fast, and are predatory. The largest are in tropical countries, some from South America being a foot long. A few small species are found in Europe. Of these *S. cingulata*, a native of France, etc., is 3½ inches long. It is rusty yellow, with the antennæ, the head, a central band, and the margins green.

Scombridæ, in ichthyology, mackerel; a pelagic family of acanthopterygian fishes, with seven genera, from all seas of the tropical and temperate zones. Body oblong, scarcely compressed; naked or covered with small scales; dentition well-developed; two dorsals, finlets generally present. The *Scombridæ* are one of the four families most useful for food, the others being the *Gadidæ*, the *Clupeidæ*, and the *Salmonidæ*. They are fishes of prey, and move about in shoals, approaching the shore in pursuit of other fishes on which they feed. In palæontology the family is well represented in Tertiary formations.

Scone, a parish in Perthshire, Scotland, lying on the left bank of the Tay. It is famous as the seat of one of the most venerable of Scotch abbeys. Scone is first mentioned in the beginning of the 10th century, when a council was held there in the sixth year of the reign of King Constantine, at which time it is styled, by the chronicle which records the fact, *regalis civitas*, the "royal city." A monastery was built at Scone probably about the same period, and there was located the famous stone on which the kings of Scotland were inaugurated, and which was carried by Edward I. of England to Westminster Abbey. Alexander III., the last of the ancient race of kings, and Robert Bruce, the founder of the new dynasty, were crowned at Scone, but after the accession of the House of Stuart the coronation sometimes took place in other churches. The last coronation which was celebrated here was that of Charles II., in 1651.

Scopas, an ancient Greek sculptor, founder, along with Praxiteles of the later Attic school; a native of the island of Paros, and flourished during the first half of the 4th century B. C. One of his earliest works we read about was the temple of Athena Alea at Tegea in Arcadia, on the site of a previous one burned down in 395 B. C.; he superintended both the building of it and the adorning of it with sculpture. Some 15 years or so later he settled in Athens, where for more than a quarter of a century he labored at his profession. Toward the end of his life he was associated with Leochares

and others in preparing sculpture for the great mausoleum of Halicarnassus in Asia Minor. A large composition representing Achilles being convoyed to Leuce by Poseidon, Thetis, and the Nereids, preserved for some time in the temple of Neptune at Rome, was accounted one of his masterpieces. Another composite work attributed to him, though doubtfully, was the "Slaughter of the Children of Niobe." He excelled also in statues of single gods and goddesses, as the "Apollo with the Lyre."

Scopelus, in ichthyology, the typical genus of the family *Scopelidæ*, with 30 species of pelagic habits, distributed over all temperate and tropical seas. Body oblong, more or less compressed, covered with large scales. Series of phosphorescent spots run along the lower side of the body, and a similar glandular substance sometimes occupies the front of the snout and the back of the tail. Dorsal nearly in middle of body, adipose fin small, anal generally long, caudal forked; branchiostegals from 8 to 10. They are small fishes, and come to the surface at night only, and in rough weather descend to great depths.

Scops Owl, in ornithology, the *Scops giu*. It is about seven inches long; plumage, in both sexes, chestnut and pale wood-brown above; grayish-white and pale brown, with streaks and patches of umber-brown beneath. The young birds have a more rufous tinge.

Scorbutus. See Scurvy.

Score, in music, compositions for several voices or instruments, or for an orchestra, so written that each part has a separate staff for itself, these staves being placed over each other, bar corresponding for bar. Occasionally, where there is a deficiency of staves for all the parts, or where any of the parts have so little to do that it is not worth while to assign them a separate staff, parts related to or connected with each other, as two flutes, two clarionets, or three trombones, may be written on the same staff together. As a general rule, the highest part should be placed uppermost, then the next lower, and gradually descending. All the parts of a chorus should be placed together.

Scoresby, William, an English Arctic explorer; born in Cropton, near Whitby, Oct. 5, 1789; commenced a seafaring life at the age of 11 by accompanying his father, a whaling captain, to the Greenland seas; and next succeeding his father, he made several voyages to the Spitzbergen and Greenland whaling grounds. He attended classes at Edinburgh University, carried on investigations in natural history, botany, meteorology, magnetism, etc., and published the results in "An Account of the Arctic Regions" (1820). In 1822 he surveyed 400 miles of the E. coast of Greenland. After one more voyage he retired from seafaring life in order to enter the Church; and having studied at Cambridge and been ordained (1825) at Bessingby, labored faithfully at Liverpool, Exeter, and Bradford. At length failing health compelled him to retire (1849) to Torquay; but he still continued his physical researches. The results of these, as of some earlier inquiries, were published in the transactions of the learned societies, and in "Magnetical Investigations" (1839–1852). For the better prosecution of these researches Scoresby made a voyage to the United States in 1847, and to Australia in 1856. He died in Torquay, March 21, 1857.

Scoriæ, the cinders and slags of volcanoes, more or less porous from the expansion of the gases contained in the melted materials.

Scorodite, a sparsely distributed mineral, occurring in crystals, only occasionally massive; crystallization orthorhombic; hardness, 3.5-4; sp. gr., 3.1-3.3; luster, vitreous to sub-adamantine; color, pale leek-green, sometimes brownish; streak, white; subtransparent; fracture uneven. Composition: Arsenic acid, 49.8; sesquioxide of iron, 34.7; water, 15.5 = 100, which corresponds to the formula, $Fe_2O_3AsO_5 + 4H_2O$.

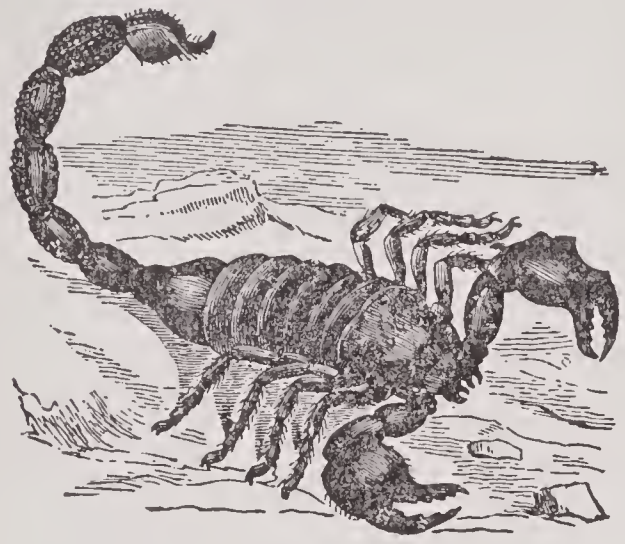
Scorpio, in astrology, the "accursed constellation," the "false sign," ominous of war, discord, and woe. It is of "watery triplicity," and is attended at its setting by tempests and by autumnal diseases. Gadbury dissented from these views, having been born when Scorpio was in the ascendant. So did the alchemists, for they believed that iron could not be transmuted into gold except when the sun was in the sign of Scorpio.

Scorpio, in astronomy, the eighth zodiacal constellation. It is bounded on the N. by Ophiuchus and Serpens, on the S. by Lupus, Norma, and Ara, on the E. by Sagittarius, and on the W. by Libra. It is a small but very brilliant constellation, especially when seen from places S. of the equator. It contains Antares or Cor Scorpii (Alpha Scorpii), of the first magnitude, and Iklil, or Beta Scorpii, of the second magnitude. Also the eighth sign of the zodiac, which the sun enters about Oct. 23.

Scorpion, in antiquity, a military engine formerly used, chiefly in the defense of a castle or town. It resembled the balista in form, consisting of two beams bound together by ropes, from the middle of which rose a third beam, called the stylus, so disposed as to be pulled up and let down at pleasure. On the top of this were fastened iron hooks, whereon a sling of iron or hemp was hung for throwing stones.

In Scripture, a painful scourge; a kind of whip armed with points like a scorpion's tail.

In zoölogy, any individual of the family *Scorpionides*. The European species are three or four inches long, and confined to the S. parts of the Continent, but scorpions have a wide geographical range in tropical and sub-tropical regions, and in Equatorial Africa and South America they grow to a length of 9 or 10 inches. The sting in the tropical species is much more formidable than that of the European scorpion, though



EUROPEAN SCORPION.

it may be doubted if it ever proves fatal to a healthy adult human being. They are nocturnal in habit, concealing themselves under stones, the loose bark of trees, and in crevices in walls, coming forth at dusk. They prey on other spiders and insects; and, seizing their prey in their palpi, which are practically useless as weapons of offense, sting it to death. The eggs are hatched in the enlarged oviducts, and the young, usually from 40 to 60, are carried about for some time on the back of the mother. Scorpions are very pugnacious, and the victor usually devours his conquered foe.

Scorpion Fish, or **Sea Scorpion,** a genus of teleostean (acanthopterous) fishes, belonging to the *Triglidæ* or gurnard family. The first dorsal fin possesses 11 spines, the second dorsal possessing one spiny ray and 9 or 10 soft rays. The anal fin is short, and has three spines and five soft rays. The red scorpion fish (*Scorpæna scrofa*) is a familiar form. The spotted scorpion fish (*S. porcus*) is a second species, and, like the preceding form, occurs in British waters as well as in the Mediterranean, Atlantic, and the tropical seas.

Scorpion Fly, a genus of insects belonging to the order *Neuroptera*, or that of the dragon flies. The name scorpion fly is derived from the appendages seen attached to the abdomen of some species. The male in the common species, for example, has the sixth and seventh joints of the abdomen attenuated, and capable of extensive motion; while the last joint forms a pair of forceps resembling those of the earwigs. When at rest this tail is curled over the back, but when irritated the forceps are used as weapons of offense or defense.

Scorpion Shell, the name given to the shells of certain gasteropodous mollusks, belonging to the family *Strombidæ*, from the projecting spines with which the shells are provided. These shells are also known by the name of "spider shells" for the same reason. They are chiefly found in the Indian and the Chinese Seas.

Scorzonera, in botany, the typical genus of *Scorzoneræ*. Bracts imbricate; receptacle naked, pappus feathery, in several rows; achenes neither stalked nor beaked, with a lateral scar. *S. hispanica* is cultivated for its roots, which are rated as a vegetable.

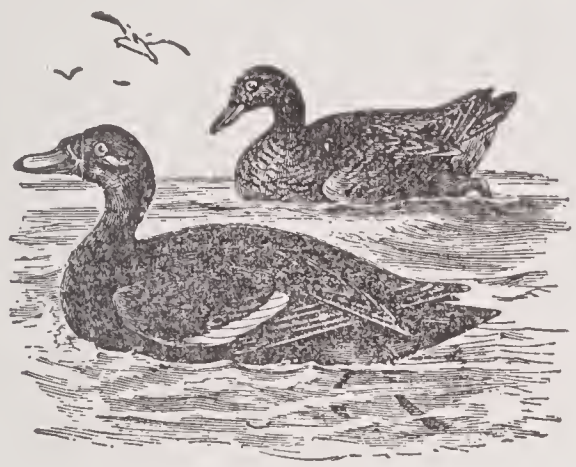
Scot, Reginald, or **Reynold,** one of the first and boldest writers against the belief in witchcraft, alchemy, astrology, and other prevalent superstitions of his time, a younger son of Sir John Scot of Scotshall, in Kent; born in the early part of the 16th century. He studied at Oxford, and spent his life in the study of old and obscure mystical authors, and the pleasures of gardening, till his death. The work on which his reputation is founded is entitled "The Discoverie of Witchcraft," and was published in 1584. By order of James I. the first edition of the book was burned by the common hangman, and the king replied to it in his "Demonology." Refutations were also published by Meric Casaubon, Joseph Glanvil, and others. He died in 1599.

Scot and Lot, an old legal phrase applied originally to the payment of parish assessment according to ability. In certain English boroughs persons paying such assessments voted for members of Parliament.

Scotch Fir, the *Pinus sylvestris*, a tree sometimes 50 to 100 feet in height, and 12 feet in girth, the wood constituting the red or yellow deal, and its resin, yielding tar, pitch, and turpentine. It is not umbrageous, but flourishes chiefly toward the top, with branches not spreading. The leaves are long, narrow, rigid, and evergreen, fascicled in pairs all round the branches; the cones are ovoid and the seeds winged. It constitutes vast natural forests in the Highlands of Scotland, occurring also in the N. of Europe, and on the mountains in its S. part, in Siberia, etc. The bark is used for tanning.

Scoter, or **Surf Duck** (*Oidemia*), a genus of sea ducks. The most familiar species is the common or black scoter (*O. nigra*), which shows a deep black plumage in the male, the bill and legs being of the same color. The upper mandible is marked on its dorsal surface by a line of orange

color. This bird averages the common duck in size; and the females are colored of a dark brown hue. It occurs in the Arctic



VELVET SCOTERS.

regions in summer. An American species of coot is known as surf duck.

Scot=free, free from payment, tax, or tribute; untaxed; exempt from scot or mulct. Hence, clear; free; whole; unharmed; safe and sound; as, he came out of the affair scot-free.

Scotia, the Latin name of Scotland, often used by her poets. The word is said to be derived from Queen Scota, the wife of a King of Ireland, who is thought to have invaded Scotland in 258 A. D. Previous to this event the land was known as CALEDONIA (*q. v.*).

Scotia Seminary, an educational institution in Concord, N. C.; for colored women; founded in 1870 under the auspices of the Presbyterian Church; reported at the close of 1901: Professors and instructors, 17; students, 287; volumes in the library, 2,000; productive funds, $5,300; grounds and buildings valued at $65,000; benefactions, $9,700; income, $16,500; number of graduates, 532; president, Rev. D. J. Satterfield, D. D.

Scotism, in philosophy, a branch of SCHOLASTICISM (*q. v.*), named after its founder, Johannes Duns Scotus (born in Dunston, Northumberland, or, according to Wadding, in County Down, Ulster), a distinguished Franciscan friar, who taught in the schools at Oxford, Paris, and Cologne, where he died in November, 1308 (at the age of 34, according to the generally received account). Scotism was a more pronounced form of Realism than Thomism, and taught that the species is numerically one, assigning to each individual a *hæccitas* — something which gives individuality apart from matter; that the created will is the total and immediate cause of its own volition; that the creation of the world and immortality of the human soul are not demonstrable by human reason; that the opinion that the Virgin Mary never contracted original sin is the "more probable" (which led to the Franciscans being recognized as the champions of the Immaculate Conception); and that an action is not necessarily good or bad, but may be indifferent. In opposition to St. Thomas Aquinas, Scotus held that the secular power may be lawfully employed to compel Jews to enter the Church.

Scotland, the N. division of the island of Great Britain; separated from England substantially by the Solway, Cheviots, and Tweed, the border isthmus being about 60 miles across; but the irregular boundary line measures fully 100 miles. On all other sides it is bounded by the sea. The greatest length, from N. N. E. to S. S. W., between Dunnet Head and the Mull of Galloway, is 287 miles. The breadth varies from 140 miles to less than 30, the latter in the N., between Dornoch Firth and Loch Broom. Few points in the mainland are more than 40 miles from the sea, the country being so much penetrated by inlets. The country was formerly divided into a number of districts, many of the names of which are still familiar, such as Lothian, Tweeddale, Galloway, Breadalbane, etc., but for political purposes it is now divided into the following shires or counties.

Counties.	Area Square Miles.	Pop. (1901.)
Aberdeen	1,955	303,889
Argyll	3,213	730,166
Ayr	1,128	254,133
Banff	641	610,439
Berwick	461	30,785
Bute	218	18,659
Caithness	686	33,619
Clackmannan	48	31,999
Dumbarton	241	113,660
Dumfries	1,063	72,562
Edinburgh	362	437,553
Elgin	476	44,757
Fife	492	218,350
Forfar	875	283,729
Haddington	271	38,653
Inverness	88	89,901
Kincardine	383	40,891
Kinross	73	6,980
Kirkcudbright	898	39,359
Lanark	882	1,337,848
Linlithgow	120	64,787
Nairn	195	9,291
Orkney	376	27,723
Peebles	355	15,066
Perth	2,528	123,255
Renfrew	245	268,418
Ross and Cromarty	3,078	76,149
Roxburgh	665	48,793
Selkirk	257	23,339
Shetland	551	27,755
Stirling	447	141,894
Sutherland	2,028	21,329
Wigtown	485	32,591
Shipping population	...	9,583
Total	29,785	4,471,957

The most important cities, with their population in 1901, are: Glasgow, 760,423; Edinburgh, 316,479; Dundee, 160,871; and Aberdeen, 153,108.

Islands and Coasts.— The islands of Scotland are said to number altogether nearly 800. On the E. coast they are few and small; but on the N. E. are the two large

Scotland

groups of the Orkneys and Shetlands, the former numbering 52 islands, 28 permanently inhabited; the latter 100 islands, 29 inhabited; while on the W. coast the islands are large and numerous. Here the Hebrides extend for 200 miles from N. to S., and are divided into the Inner and Outer Hebrides, the former lying close to the W. coast of the mainland and stretching from Skye to Islay; the latter parted from the Inner Hebrides by the straits of the Minch and the Little Minch, comprise the long chain of islands from Lewis to Benbecula. Inclosed in the Firth of Clyde are the islands of Arran, Bute, and the Cumbraes, forming a county by themselves. The W. coast of the mainland is generally a wild, deeply indented mountain wall, presenting a series of inlets or sea lochs, while toward the middle the coast is cleft by two great inlets with openings to the S. W., the Firth of Lorn and its continuation Loch Linnhe, and the Firth of Clyde and its ramifications running far inland. The E. coast is sometimes low and sandy, but is often formed of steep rocky cliffs of considerable elevation, the chief inlets being the Firth of Forth and Tay, and the Moray Firth, Cromarty Firth, etc.

Surface.— Both from the configuration of the surface and the geological structure the country divides into three divisions, the Highlands, Central Lowlands, and Southern Uplands. The first of these divisions lies N. of a line stretching in a S. W. direction from the coast of Kincardineshire to the Firth of Clyde; the third is the country S. of a line drawn from Dunbar S. W. to Girvan; the country between these lines forms the Central Lowlands. The Highland division is remarkable for the number and elevation of its mountain masses (many of the summits being over 4,000 feet high. The mountains best known by name are the Grampians, which form a system or series of masses covering a large area, and culminating on the W. coast in Ben Nevis, 4,406 feet high; while 55 miles to the N. E. rises a remarkable cluster of summits reaching in Ben Macdhui the height of 4,296 feet. The Grampians and their connections are separated from the mountains farther to the N. by Glenmore or the Great Glen of Scotland, a remarkable depression stretching quite across the country from sea to sea, and forming, by the series of lakes occupying it and the Caledonian canal connecting them, a waterway from the W. coast to the E. The Southern Uplands are also essentially a mountainous region, summits of over 2,000 feet being frequent, though none exceed 3,000 feet above the sea. The central region, though much less elevated than the other two divisions, has none of the monotony usual in flat countries. Though occupying not more than a sixth of the whole surface, the fertility of the soil and its mineral treasures make this part by far the wealthiest and most populous. The present form of the land surfaces of Scotland is the effect of erosion or denudation. The country was at one time an elevated table-land, the upper surface of which is indicated by the summits of the mountain masses, but has been deeply trenched and furrowed in all directions by the erosive action of water, ice, and frost. The slope of the ancient plateau may be determined by the direction of the principal rivers; in the N. part it is chiefly toward the E., in the S. more equally E. and W.

Rivers and Lakes.— The chief rivers flow (roughly speaking) to the E., and enter the German Ocean, the largest being the Tweed, Forth, Tay, South Esk, North Esk, Dee, Don, Deveron, Spey, and Findhorn; those entering the sea on the W. are the Clyde, Ayr, Doon, Dee, Nith, Annan, and Esk. The Tay carries to the sea a larger quantity of water than any river in Great Britain, but neither it nor most of the others, except when they form estuaries, are of much use for navigation. The Clyde, however, in its lower course carries a vast traffic, this being rendered possible chiefly by dredging. Many of the rivers are valuable from the numbers of salmon they produce. A striking feature of the country is the great multitude of lakes, varying in size from Loch Lomond (28 square miles) to the pool-like mountain tarns. In the Northern Highlands almost every glen has its lake and every mountain hollow is filled by a stream or spring. Among the more noted are Lochs Lomond, Katrine, Tay, Earn, Rannoch, Awe, Shiel, Laggan, Lochy, Ness, Maree, Shin, in the Western and Northern Highlands; Loch Leven, in the Central Lowlands; and St. Mary's Loch, Lochs Ken, Dee, and Doon in the Southern Uplands.

Geology.— As regards geology the older or palæozoic rocks predominate almost everywhere in Scotland. The Highlands are composed almost entirely of crystalline schists, gneiss, and quartzites; the Central Lowlands of old red sandstone, carboniferous, and Permian strata; the Southern Uplands mostly of rocks of Silurian age. In certain localities remains of secondary formations are represented over small spaces, while volcanic rocks cover considerable areas. Granite exists in great masses in many localities, and in some parts is extensively quarried. The most valuable mineral region is the Central Lowlands, where coal and iron exist in such quantity as to make this one of the most important mineral fields of Great Britain.

For agriculture, manufacture, and commerce, see GREAT BRITAIN.

Scotland

Political Constitution.— The Parliament of Scotland anciently comprised all who held any portion of land, however small, from the crown by tenure of military service, till the reign of James VI., when the small barons or freeholders were excused from attendance in person, "two or more wise men" being deputed from each county in proportion to its size. Its powers were nominally extensive, but the supreme power was virtually in the king, who by his influence often entirely controlled its proceedings. The Parliament in the whole consisted of three estates — the nobility, the dignified clergy (consisting of bishops, abbots, and priors), and the lesser barons, or representatives of shires and burghs. When PRESBYTERIANISM (*q. v.*) was formally ratified by law after the revolution of 1688, the ecclesiastical estate ceased to have a place in Parliament. Every measure brought before Parliament was previously prepared by a committee, styled the lords of the articles, chosen from each of the three orders, but in effect little better than royal nominees. Before the Union there were four great officers of state — the lord high-chancellor, the high-treasurer, the lord privy-seal, and the secretary; and there were also four lesser officers — the lord clerk-register, the lord-advocate, the treasurer-depute, and the justice clerk. Previously to the era of the Revolution the privy council of Scotland assumed inquisitorial powers, and even torture was administered under the sanction of its authority; but it is now entirely merged in the privy council of Great Britain. The number of peers in the Scotch Parliament was formerly 160, and of commons 155, and all sat in one house and voted promiscuously. At the union of the kingdoms the political system of Scotland was almost entirely incorporated with that of England. (See GREAT BRITAIN, *Government.*)

The Court of Sessions is the supreme civil court of Scotland. The Court of Justiciary, or criminal court, composed only of judges of the Court of Session, is supreme in the highest sense, since its decisions in criminal cases are not subject to any review. The principal subordinate judicatories are sheriff courts, established in each county or stewartry. Sheriff-substitutes, or judges ordinary, one or more holding separate courts in different districts, decide in the first instance, subject to the review of the principal sheriff or sheriff depute, whose decisions, though final within the limits of his jurisdiction, are reviewable by the Court of Session, with the exception of classes of cases provided for by special statutes. Besides the sheriff court, each county or district of a county has its justice of peace courts, in which judges, not stipendiary, decide on principles of equity in minor crimes; and in every town of any importance are bailie, dean of guild, and police courts, with limited jurisdictions.

Education.— Scotland has had the advantage of a national system of elementary education for over two centuries, a school having been established in every parish by a law of 1696, according to a system proposed by John Knox long before. This scheme did effective service for the education of the people, till the great increase of population, especially in towns, rendered it unequal to the task laid on it, and this notwithstanding the erection of many schools by various religious denominations. By the passing of the Education Act of 1872 board schools have superseded the old parish schools, there being also numerous grammar or high schools and academies in every town of any size, though no systematic scheme of secondary education. Other institutions are the normal or training schools and colleges of the different religious bodies, and the four universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews. The first university was that of St. Andrews, dating from 1411; next came that of Glasgow (1450), then King's College and University Aberdeen (1494), then Edinburgh University (1582), lastly Marischal College and University Aberdeen (1593). The two Aberdeen universities were united in 1860.

History.— Scotland was first visited by the Roman troops under Agricola, who penetrated to the foot of the Grampian Mountains. It was afterward exposed to the ravages of the Norwegians and Danes, with whom many bloody battles were fought. Various contests were also maintained with the Kings of England. Robert Bruce, however, secured the independence of the country and his title to the throne by the decisive battle of Bannockburn in 1314. He was succeeded by his nephew, Robert Stewart, and he by his eldest son, Robert. He being a weak prince, the reins of government were seized by the Duke of Albany, who stoned to death the eldest son of the king. James, his second son, to escape a similar fate, fled to France; in the year 1424 he returned to Scotland, and having excited the jealousy of the nobility, he was assassinated in a monastery near Perth. James II., his son, an infant prince, succeeded him in 1437. He was killed by the bursting of a cannon at the siege of the castle of Roxburgh. James III. ascended the throne at the age of seven years. His reign was weak and inglorious, and he was murdered in the house of a miller, whither he had fled for protection. James IV., a generous and brave prince, began his reign in 1488. He was slain at the battle of Flodden. James V., an infant of less than two years of age, succeeded to the crown. He died in 1542, and was succeeded by his

daughter, the eelebrated Queen Mary, whose history and tragical end are well known. She was succeeded by her son James, who, in 1603, ascended the throne of England, vaeant by the death of Queen Elizabeth, when the two kingdoms were united into one great monarchy which was legislatively united in 1707. In 1715 and 1745, unsuccessful attempts were made for the restoration of the exiled Stuarts.

Scotland, Church of. The original Scoteh Church seems to have been that of the Culdees, then in mediæval times the Roman Catholic Church was, to a certain extent, the national church in Scotland, not merely as having within its pale at least by profession all the people, but as maintaining its independence of its powerful S. neighbor. The church resisted the claims of supremacy over it put forth at one time by the Archbishop of York, at another by the Archbishop of Canterbury; and in 1176 in self-defense cast itself into the arms of the Roman pontiff. When the Reformation struggle began, the crown remained adherent to the old faith, while the nobility tended to adopt the new. From the war of independence Scotland had considered it good policy to guard against any aggression on the part of England by a close alliance with France, and when the Reformation began there were actually French troops in Scotland. On these the crown rested to resist the religious movement which had been begun, but the Protestant "Lords of the Congregation," who had taken up arms to defend their cause, applied for aid to Queen Elizabeth, who sent troops to aid them in expelling the French. By a treaty signed on July 7, 1560, it was stipulated that both the French and the English troops should withdraw from Scotland. On Aug. 24 of the same year the Scotch Parliament abolished the papal jurisdiction, prohibited the celebration of the mass, and rescinded all the laws made in favor of Roman Catholicism. The reformers adopted what is now called PRESBYTERIAN CHURCH (*q. v.*) government, though certain superintendents were appointed, with the sanction of John Knox, the great Scotch reformer, whose offices after a time were swept away. The first General Assembly was held on Dec. 20, 1560. When the victory over the Church of Rome was complete, the alliance between the nobility and the Protestant preachers which had effected the triumph showed symptoms of dissolving, and a large section of the former viewed with distrust, and even active hostility, what they regarded as the too democratic measures which Knox aimed at carrying out. But one inestimable boon was gained before they parted, the universal establishment of parish schools.

The semi-republican constitution of the Church, which beeame more marked after the office of superintendent had been swept away, and the second book of discipline published (the latter event in 1578), created jealousy in the minds of regents and of sovereigns, and four or five generations of Stuart kings put forth long and determined efforts to transform Presbyterian into Episcopal government. The project cost the lives and liberties of far more people than the short, sharp Reformation struggle had done, and ended at last in failure. The Revolution settlement of 1690, reëstablished Presbyterianism, and the General Assembly, which had been interrupted for nearly 40 years, began again to sit and has done so annually from that time till now. Prior to the union with England in 1707, an Act of Security was passed, designed to preserve the Scotch national Church from being overthrown by S. votes.

In 1712 an Act of Parliament reintroduced patronage which had been swept away. The operation of this enactment was one main cause of three secessions: that of the Secession, preëminently so called, in 1733; the Relief in 1752; and, the greatest of all, that which created the Free Church in 1843.

The Church of Scotland claims about half the people as at least its nominal adherents. Besides the General Assembly, it had in 1901, 16 synods, 84 presbyteries, 1,585 congregations, 1,700 ministers and probationers engaged in ministerial work. It has missions in India, Africa, and elsewhere. In 1784 the Patronage Act of 1712 was repealed, and each congregation now elects its own pastor. Its chief rivals in Scotland are the Free Church and the United Presbyterians, the latter resulting from a union of the old Secession and Relief Churches.

Scotland, Garden of. See GARDEN OF SCOTLAND.

Scots. See PICTS.

Scots Guards, the name of a well-known regiment of guards in the British army, which possesses most national interest as that of the Scotch force which served the Kings of France. The alliance of the Scotch and the French, never, perhaps, very cordial and spontaneous on either side, lasted, nevertheless, for a very long period, and was maintained by common interest and reciprocal benefits, and is still distinctly traceable in the Scotch language, laws, and institutions. This alliance originated and developed in the persistent efforts of the Edwards and their successors to subdue both France and Scotland to the English crown. In no outward fact, however, does this alliance appear more conspicuously and interestingly than in the history of the Scots Guard or Scottish Archers in France, extending over 400 years, from 1418 to 1830. All Scotland and all Europe is familiar with the vivid

picture of that theme presented by Walter Scott in "Quentin Durward," in Le Balafré, in the veteran Lindsay, and in the other living figures of that romance, which is mainly based on fact.

In the distracted, almost hopeless, state to which Henry V. of England reduced France in the time of Charles VI. the Scotch archers, who then began to flock thither in large numbers by way of La Rochelle, the only port at that time not yet in possession of the English, distinguished themselves as the stanchest element in the French forces, as the rallying center of a new army. From 7,000 to 10,000 landed in 1419 under the command of the Earl of Buchan. The great victory of Charles VII. at Baugé on March 22, 1421, celebrated in the French court by a whole month's rejoicings, was the achievement of Scotch valor. In that engagement the Duke of Clarence was unhorsed by Sir John Swinton, and had his death-blow dealt him by the Earl of Buchan, who was rewarded with the highest military office in France — that of constable. At Verneuil in 1424 the Scotch fought to the last with stubborn determination, but the English gained a bloody victory. Soon after this the Scotch gentlemen were constituted the king's special bodyguard, and Archibald, Earl of Douglas, who had come over from Scotland at the invitation of the king, was created Duke of Touraine.

Of the 15 companies of men-at-arms, the beginning of a standing army, formed by Charles VII. two were composed exclusively of Scotchmen — "Les Gendarmes Écossais" and "La compagnie Écossaise de la Garde du Corps du Roi." Subsequently Louis XII. solemnly recognized "that the institution of the Scotch Men-at-arms and the Scots Lifeguards was an acknowledgment of their services and their great loyalty and virtue." To the league against his father the Dauphin (afterward Louis XI.) tried in vain to gain over the Scots Guards, and after his own accession to the throne Louis XI. rewarded their constancy by increased pay and privileges. And assuredly he had no cause to regret his favor toward them, for on two occasions he had them to thank for his personal safety; the first time, after the drawn battle of Montlhéry, when "the Scots Guards, considering the danger the king was in, took his majesty, who had been in arms all day without eating or drinking, and carried him safe to the castle of Montlhéry"; the second time, when Louis XI. would have fallen in the furious night sortie of the Liegeois against the besieging forces of France and Burgundy but for the valiant defense of the Scots Guards. In the field of Seminara, when the French cavalry were *culbute* and the Italian rear guard had fled, the Scotch still stood their ground, refusing to fly or surrender, and preferring to be hewn down, as they were to the number of 400. In the wars of Charles VIII., Louis XII., and Francis I., the Scotch took a leading part.

After Scotland became Protestant the alliance with France naturally declined. Yet in the war of Richelieu with the Spanish monarchy we find, besides the Scotch men-at-arms under Lord Gordon, the regiment of the Gardes Écossaises, Sir John Hepburn's famous regiment, Forbes's corps of infantry and cavalry, and Colonel Douglas' regiment — all purely Scottish; and under Louis XIV. the Scotch continued to take precedence of the rest of the army, heading the French in all the great battles of that reign, Minden, fought on Aug. 1, 1759, being the last in which they figured. After this time the regiments, though they retained the Scotch name, were recruited mainly by French youths; and at the Revolution Scots Guards and men-at-arms were, of course, disbanded. Reinstated again in their old privileges, they finally disappeared with the old monarchy in 1830.

Scott, Alexander, a Scotch poet; born about 1525; "the Anacreon of old Scotch poetry." Of his writings 36 short poems remain; the most important of these are "A New Yeir Gift to Quene Mary" and "The Justing at the Drum." He died about 1584.

Scott, Andrew, a Scotch poet; born in Bowden, Roxburghshire, in 1757. He served in the British army in this country during the Revolution, and was with Cornwallis at the surrender of Yorktown. While he was encamped on Staten Island he wrote his noted verses "Betsey Roscoe" and "The Oak-Tree." After the war he returned to his native land, and published "Poems, Chiefly in the Scottish Dialect" (1811), and "Poems on Various Subjects" (1826). He died in Bowden, May 2, 1839.

Scott, Austin, an American educator; born in Maumee, O., Aug. 10, 1848; was graduated at Yale University in 1869; taught German in the University of Michigan in 1873-1875; Professor of History in Rutgers College in 1883-1890; president in 1890-1906; then Professor of History and Political Science there; associated with George Bancroft in the preparation of his "History of the Constitution of the United States."

Scott, Clement William, an English dramatist; born in London in 1841. He wrote: "Lays of a Londoner" (1882); "Lays and Legends" (1888); the dramas "The Cape Mail," "Odette," and "Sister Mary." He died June 25, 1904.

Scott, David, a Scotch painter; born in Edinburgh, Oct. 10, 1806. His father was a landscape engraver. Scott, however, had early determined to become a painter, and in 1828 he exhibited his first picture, "The

Hopes of Early Genius Dispelled by Death." In 1832 he visited London, Paris, and Geneva, most of the art cities of Italy, and finally reached Rome, where he studied during two years and painted several original works, among which was one of his greatest efforts, "The Household Gods Destroyed." Having returned to Edinburgh he continued the practice of his art and became a regular contributor to the exhibitions of the Scottish Academy. Among his chief pictures are: "Vasco de Gama Encountering the Spirit of the Storm at the Cape"; "Queen Elizabeth at the Globe Theater viewing the performance of the Merry Wives"; Paracelsus lecturing to his Students on the Elixir of Life"; "The Duke of Gloucester carried to Prison" (Scott's finest work); "Ariel and Caliban"; "A Vintager"; "Peter the Hermit Preaching the First Crusade"; "Orestes and the Furies," etc.; besides designs in outline for the "Ancient Mariner," the "Pilgrim's Progress," etc. He died in Edinburgh, March 5, 1849.

Scott, Duncan Campbell, a Canadian poet; born in Ottawa, Ont., Aug. 2, 1862. He is author of "The Magic House" (1893), and other works.

Scott, Fred Newton, an American educator; born in Terre Haute, Ind., Aug. 20, 1860; was graduated at the University of Michigan in 1884; was assistant librarian in that institution in 1884–1885 and in 1887–1889; became instructor of English in the same in 1899, and assistant Professor of Rhetoric in 1890; and was made full Professor of Rhetoric in 1900. His publications include: "Æsthetics, Its Problems and Literature" (1890); "Principles of Style" (1890); editions of Lewes' "Principles of Success in Literature" (1891); of "Spencer's Philosophy of Style" (1891); of De Quincey's "Essays on Style, Rhetoric and Language" (1893); of Webster's "Orations" (1897); etc.

Scott, Frederick George, a Canadian poet; born in Montreal, Canada, April 7, 1861. He wrote: "The Soul's Quest" (1888); "My Lattice, and Other Poems" (1894); "The Unnamed Lake and Other Poems" (1897); etc.

Scott, Sir George Gilbert, an English architect; born in Gawcott, near Buckingham, July 13, 1811. His tastes drew him mainly to the study of Gothic architecture, and to him is due in a great measure its revival in Great Britain. He was very largely employed in the erection of new churches, colleges, and secular public buildings, among which may be mentioned the Church of St. Nicholas at Hamburg, the first important specimen of the Gothic revival erected in Germany, and the spire of which is 478 feet high; the Foreign Office, the India Office, and the Home and Colonial Offices, London; Glasgow University; the Memorial to the Prince Consort, London; and St. Mary's Cathedral, Edinburgh. Sir Gilbert was specially identified with the process termed "restoration," which he applied to many important minsters and churches, such as the cathedrals of Ely, Lichfield, Hereford, Ripon, Gloucester, Chester, St. David's, St. Asaph, Bangor, Salisbury, and St. Albans. In this connection he wrote a "Plea for the Faithful Restoration of our Ancient Churches" (1850); "Conservation of Ancient Architectural Monuments" (1864); etc. He was elected A. R. A. in 1852, and R. A. in 1860, and was knighted in 1872. He died in London, March 27, 1878.

Scott, Hugh Lenox, an American military officer; born in Danville, Ky., Sept. 22, 1853; was graduated at the United States Military Academy in 1876, and detailed to duty in the West, where he served in numerous Indian campaigns till 1897, receiving honorable mention from the War Department for his gallantry in the "Ghost-dance" outbreak in 1891. At the beginning of the American-Spanish War he was placed in command of the 1st Army Corps; was appointed adjutant-general of the Department of Havana in 1899; and of the Department of Cuba in 1900. He is the author of a monograph on the "'Sign Language of the Plains Indians"; numerous papers, official reports, etc.

Scott, Irving Murray, an American shipbuilder; born in Hebron Mills, Md., Dec. 25, 1837; was educated at the Baltimore Mechanics' Institute; entered a machine shop in Baltimore and became an expert draughtsman and engineer; went to San Francisco, Cal., where he was made superintendent and later a partner in the Union Iron Works. He designed the machinery for the Comstock mines; invented and improved cut-off engines and other machines; and was the builder of the famous battleship "Oregon" besides other ships of the United States navy. In 1898 he went to St. Petersburg to advise the Russian government in regard to the building of warships. He was president of the Mechanics' Institute and the Art Association of San Francisco; regent of the University of California; and trustee of the Leland Stanford, Jr., University. He died April 28, 1903.

Scott, James Hutchinson, an American naval officer; born in East Liberty, Pa., Feb. 11, 1868; was graduated at the Cadet School of the Revenue Cutter Service in 1890; and assigned to duty on the revenue cutter "McLane." At the beginning of the American-Spanish War he was made executive officer of the revenue cutter "Hudson," which took a distinguished part at the battle of Cardenas Bay, Cuba, May 11,

1898; and was presented with a medal by the United States government for gallantry in that engagement. After the war he was assigned to the revenue cutter "Manhattan," and later to the "Washington." He was navigator of the "Gresham" when she rescued the Portuguese bark "Fraternidada," saving 113 lives, and subsequently was appointed executive officer of the "Perry." See BAGLEY, WORTH.

Scott, Lady Lydia, an English miscellaneous writer. Besides stories, as "Flirtation," "Marriage in High Life," and "The Henpecked Husband" (1848). She wrote: "Exposition of the Types and Antitypes of the Old and New Testament" (1856); "Incentives to Bible Study" (1860); "The Dream of a Life" (1862).

Scott, or **Scot, Michael,** a Scotch philosopher of the 13th century. Of his life little is known. His nationality even is in doubt: the Italians and the Spaniards as well as the Scotch claimed him as their countryman. His great learning won for him the reputation of being a magician. His acquaintance with Arabic enabled him to translate into Latin the works of Avicenna and Averroes, and the Arabic versions of Aristotle with the commentaries of Averroes. His own writings treat of astrology, alchemy, and the occult sciences in general; among them are treatises "On the Sun and Moon," "On Palmistry," "On Physiognomy and Human Procreation." According to traditions he died in 1291 and was buried in Melrose Abbey.

Scott, Michael, a Scotch author; born in Glasgow, Scotland, Oct. 30, 1789; was educated at the high school and university of his native city; resided in Jamaica, engaged in commerce and agriculture, 1806–1822; settled in Scotland, and embarked in commercial affairs. He wrote: "Tom Cringle's Log," and "The Cruise of the Midge." He died in Glasgow, Nov. 7, 1835.

Scott, Patrick, a British poet, author of "Oriental Musings, and Other Poems" (1840); "Love in the Moon," a poem (1852); "Thomas à Becket, and Other Poems" (1853); "Footpaths between Two Worlds, and Other Poems" (1859).

Scott, Robert Kingston, an American military officer; born in Armstrong co., Pa., July 8, 1826; became a practising physician; was made lieutenant-colonel of the 68th Ohio Volunteers in October, 1861; promoted colonel in 1862; distinguished himself in various campaigns, notably that in Mississippi. Later he was captured near Atlanta, but was exchanged in time to participate in Sherman's operations around that city; was promoted Brigadier-General of volunteers in January, 1865, and brevetted Major-General in December following. In 1865–1868 he was assistant commissioner of the Freedman's Bureau in South Carolina. In 1868 he was elected the first governor of the reconstructed State of South Carolina on the Republican ticket, and in 1870 was reëlected by a majority of more than 33,500. In 1871 the "Ku Klux Klan" perpetrated outrages which caused so much excitement that Governor Scott called on the Federal authorities for aid, and United States troops were sent to restore order. Later General Scott settled in Napoleon, O., where he died Aug. 13, 1900.

Scott, Sutton Selwyn, an American lawyer; born in Huntsville, Ala., Nov. 26, 1829; was graduated at the University of Tennessee in 1850; held a seat in the Alabama Legislature in 1857–1858 and in 1859–1860; was commissioner of Indian Affairs for the Confederacy in 1863; was again a member of the Alabama Legislature in 1884 and 1890. He also served as United States commissioner to adjudicate claims in New Mexico and Colorado in 1885–1887. His publications include: "Southbooke — Southern Tales and Sketches" (1880); "The Mobilians: or Tales about the South"; etc. He died in 1907.

Scott, Thomas, an English clergyman; born in Braytoft, England, Feb. 16, 1747. He was ordained in 1773; in 1781 he became curate of Olney; in 1785 he obtained the chaplainship of the Lock Hospital, near Hyde Park Corner, London; and in 1801 he was appointed rector of Aston Sanford, in Buckinghamshire. He is now remembered chiefly by his "Commentary, or Family Bible with Notes," which has had a very large sale both in England and the United States. He died in Aston Sanford, April 16, 1821.

Scott, Thomas Alexander, an American railroad manager; born in Loudon, Pa., Dec. 28, 1824; became connected with the Pennsylvania railroad in 1850; was made its general superintendent in 1858, and its vice-president in the following year. When the Civil War broke out he was placed on the staff of Gov. Andrew G. Curtin of Pennsylvania, and had charge of the sending of volunteers to the front. In April, 1861, the Secretary of War requested him to build a railroad branch from Philadelphia to Washington, which he did in a surprisingly short time; in May, 1861, he was commissioned a colonel of volunteers and placed in command of all government telegraphs and railroads. On Aug. 1 of the same year he was appointed assistant Secretary of War. He resigned this post in June, 1862, to give his time wholly to railroad management; but reëntered the service of the government in September, 1863, and directed the movement of two army corps to Chattanooga to relieve Gen. William S. Rosecrans. Though he transported these troops by a great number of trains, many

of which had to run over improvised tracks connecting various lines, he accomplished the task with remarkable quickness. He was president of the Pennsylvania Railroad Company in 1874–1880. In the latter year he was forced to resign by ill health. He died in Darby, Pa., May 21, 1881.

Scott, Sir Walter, a British author; born in Edinburgh, Scotland, Aug. 15, 1771. He passed his youth in the pleasures of hunting, in the study of law, and in reading old plays, romances, travels, and marvellous adventures. He studied the antiquities and ancient poetry, the old chronicles, the customs, obsolete laws, traditions and the superstitious beliefs of the Scotch. He made his début as an author in "Minstrelsy of the Scottish Border," which had great success. His next work, the "Lay of the Last Minstrel," was received with still greater favor. "Marmion," "The Lady of the Lake," and "Rokeby," followed. Subsequently appeared "Paul's Letters to his Kinsfolk," and the "Battle of Waterloo." His novel of "Waverley" appeared in 1814, followed by "Guy Mannering"; "Tales of my Landlord"; "Ivanhoe""; "The Monastery"; "The Abbot"; "Quentin Durward"; "Peveril of the Peak"; "Woodstock"; "Rob Roy"; "The Heart of Midlothian"; "Chronicles of the Canongate"; etc. From the commencement of his literary career in 1796, when he published his translations of Burger's "Lenore" and "Wild Huntsman," to the year of his decease, he was constantly producing some literary work and reaped an abundant harvest. His patrimonial estate was considerable; and in 1800 he obtained the preferment of sheriff of Selkirkshire, with about £300 ($1,500) a year, and in 1806 he was appointed one of the principal clerks of the session in Scotland. In 1811 he built a mansion on the Tweed, to which he gave the name of Abbotsford. Here he continued to reside, exercising the most open hospitality, and receiving the homage of admiration from all parts of the world, while he pursued his literary labors with unremitting activity. In 1821 he was made a baronet by George IV. In 1825 the firm of Constable & Co., at Edinburgh, engaged Scott to compose a "Life of Bonaparte." It was in progress when these publishers became bankrupts, and Scott found himself involved on their behalf, and began, at the age of 55, the task of redeeming a debt exceeding $500,000. His work, which appeared during the summer of 1827, in nine volumes 8vo, realized the sum of $60,000, being at the rate of $165 a day for the time he had devoted to it. From the time of the publication of "Waverley" Scott had been generally considered the author of the "Scotch Novels," yet he had managed to preserve his incognito, and the author was styled the "Great Unknown." In 1827 he acknowledged the authorship. Besides his novels Scott wrote: "Tales of a Grandfather"; a "History of Scotland"; "Letters on Demonology and Witchcraft"; etc. After the payment of $270,000, his creditors presented to him the library and manuscripts, curiosities, and plate, which had once been his own. In 1831 he went to Italy for his health, returning the following year. He died in Abbotsford, Sept. 21, 1832, and was buried in Dryburgh Abbey, which had belonged to one of his ancestors. "The Life of Sir Walter Scott" was written by his son-in-law, J. G. Lockhart.

Scott, William Amasa, an American educator; born in Clarkson, N. Y., April 17, 1862; was graduated at the University of Rochester in 1886; Professor of History and Political Science at the University of South Dakota in 1887–1890; instructor of History at Johns Hopkins University in 1892–1893; associate Professor of Political Economy at the University of Wisconsin in 1893–1897; full professor in 1897–1900; then became director of a School of Commerce and Professor of Economic History and Theory at the university. He was a member of various historical and economic societies and author of numerous books on political economy, education, history, etc.

Scott, William Bell, a Scotch poet; born near Edinburgh, Scotland, Sept. 12, 1811. He was also a distinguished painter and archæologist. He published: "Hades, and Other Poems" (1839); "The Year of the World: A Philosophical Poem" (1846); a "Memoir" of his brother David (1850); antiquarian "Gleanings in the North of England" (1849–1851); "Chorea Sancti Viti" (1851); "Poems" (1854); another volume of "Poems" (1875). He died in Penkill Castle, Ayrshire, Scotland, Nov. 22, 1890.

Scott, Winfield, an American military officer; born near Petersburg, Va., June 13, 1786; was educated at William and Mary College, and studied law. In 1808 he was appointed captain of light artillery in General Wilkinson's division, stationed at Baton Rouge, La.; but was suspended for having accused his general of complicity with the conspiracy of Aaron Burr. At the commencement of the War of 1812 he was appointed lieutenant-colonel and fought at Queenstown Heights. In 1813 he was promoted adjutant-general; in 1814, Brigadier-General and brevet Major-General. On July 3 he took Fort Erie, on the 5th fought the battle of Chippewa, and 20 days after, that of Lundy's Lane. He took part in the operations against the Seminoles and Creeks (1835–1837), in the Nullification disturbances in South Carolina, and in the Cana-

Scottish Philosophy

dian revolt of 1837–1838. In 1841 he was appointed Commander-in-Chief of the United States army, and in 1846 commanded in the Mexican War. In 1847 he won the victories of Vera Cruz, Cerro Gordo, Jalapa, Perote, Puebla, Contreras, Churubusco, Molino del Rey and Chapultepec; and seized Mexico, Sept. 14. The same year he was brevetted Lieutenant-General. In 1859 he was a commissioner to settle the San Juan dispute with Great Britain; and in 1852 was the unsuccessful candidate of the Whig party for the presidency. In 1861 he retired from office, retaining, by special act of Congress, his pay and allowance. General Scott compiled the "General Regulations of the Army," and translated and adapted from the French the system of "Infantry Tactics" which was used as the text-book of the army. In 1864 he published his "Autobiography." He died in West Point, N. Y., May 29, 1866.

Scottish Philosophy, a form or school of philosophy taught by Scotchmen in Paris and other foreign universities during the Middle Ages and as late as the 16th century. The school may, for all practical purposes, be said to take its rise in the revulsion headed by Reid (1710–1796) against the conclusions of the great sceptic. Antiquarian research has sought to place the foundation of the school earlier, in the teaching, for example, of Gershom Carmichael, who was professor in Glasgow from 1694 to 1729, or George Turnbull, Reid's teacher at Aberdeen, who lectured from 1721 to 1748. Francis Hutcheson, who succeeded Carmichael in Glasgow, and lectured from 1729 to 1746, is more frequently mentioned as the founder of the school, but he has a place rather among the succession of English moral philosophers, while the two other names are too obscure to be of any real account. Reid's answer to Hume appeared in 1764 under the title "An Enquiry into the Human Mind on the Principles of Common Sense." Hence the current but somewhat misleading designation of Reid and his followers as the Common Sense school, which seems to imply an appeal from philosophical conclusions to the unreasoned verdict of ordinary consciousness. No doubt a certain warrant for this view of the Scottish philosophers may be found in certain passages of Reid himself, and still more in the diatribes of the lesser men, like Beattie and Oswald, who joined in the outcry against Hume.

Common sense, however, meant to Reid simply the common reason of mankind, as constituted by certain fundamental judgments which are expressed in the very structure of human language, and which are intuitively recognized by the mind as true. Reid's answer to Hume thus consists in traversing his reduction of experience to unconnected ideas. He attempts to show by a deeper analysis of experience that the having of ideas, or rather of knowledge, implies certain primitive or fundamental judgments as irreducible elements. This constitutes his attack on what he calls "the ideal theory," that is to say, on the presuppositions which he finds common to Descartes, Locke, Berkeley, and Hume; and in this, its most philosophical aspect, his theory may be compared with Kant's vindication of the categories as elements necessary to the constitution of the simplest experience. The weakness of Scottish philosophy has lain in its tendency to treat these rational elements as isolated intuitions. The reiterated appeal to "the testimony of consciousness" is a short and easy method of disposing of an opponent, but it is apt to leave the opponent unconvinced. The natural dualism or natural realism which forms such an outstanding feature of Scottish philosophy asserts, against subjective idealism, that the object or the non-ego is given in knowledge along with the subject. But this important epistemological position degenerates too often into a crude metaphysical dualism of mind and matter as two heterogeneous substances.

Scottish philosophy has not produced anything like a metaphysical system, but its inductive method of procedure has led to a large amount of valuable psychological observation both in the intellectual and moral sphere of mental activity. This is mainly what we find in Dugald Stewart (1753–1828), accompanied by a power of persuasive eloquence which made philosophy a force and a tradition in the national life. Dr. Thomas Brown (1778–1820), his successor in the Edinburgh chair of moral philosophy, was led by his acute psychological analysis so far in the direction of English associationism that he can hardly be counted a continuator of the school. The most eminent successor of Reid and Stewart was Sir William Hamilton (1788–1856), who endeavored to combine the traditional Scottish doctrine with the negative results of the Kantian critique of knowledge. Apart from his contributions to psychology and logic, his philosophy is in the main an assertion of the relativity of human knowledge, and the impossibility, therefore, of reaching a coherent metaphysical view of the universe. This position, however, has been disclaimed by McCosh and others as savoring too much of agnosticism, and as inconsistent with the original position of Scottish philosophy in regard to our immediate knowledge of mind and matter. Scottish philosophy has had a wide influence not only in Scotland and the United States, but also in France, through Cousin and his "spiritualistic" followers.

Scotus Erigena. See ERIGENA.

Scouring, any one of various processes for treating, and especially for cleaning, materials. The term is applied to cleaning by friction and to the use of chemical agents for removing foreign substances. For cleaning textile and fibrous materials, soap is the commonest detergent, but many others are also in general use—soda, ashes, clayey earths, ether, ammonia, oil of turpentine, various acids, etc. Ox-gall usually dissolves grease without injuring colors.

Scovel, Sylvester, an American journalist; born in Denny Station, Pa., July 29, 1869; was educated at the University of Michigan; went to Cuba as war correspondent for the New York "Herald" and the Pittsburg "Dispatch" in October, 1895; was imprisoned in Havana in January, 1896, but made his escape. He was then employed by the New York 'World"; broke through the Spanish police and military lines 30 times; was captured by the Spaniards in February, 1897, and imprisoned in Sancti Spiritus, Cuba, but was released on the request of the United States government. He next represented the New York "World" in Greece during the war between that country and Turkey; was sent by the same paper to Spain; later to the Klondike, Alaska; and afterward to Havana, which city he reached just before the destruction of the "Maine." He was with the United States army and navy till the surrender of Santiago. He died in 1905.

Scovel, Sylvester Fithian, an American educator; born in Harrison, O., Dec. 29, 1835; received a collegiate education; became a Presbyterian clergyman in 1857 and held various pastorates; was made president and Professor of Morals and Sociology in the University of Wooster in 1883; resigned the presidency in 1898, but retained the professorship. His publications include: "Centennial History of the First Presbyterian Church of Pittsburg"; etc.

Scranton, a city and county-seat of Lackawanna co., Pa.; on the Lackawanna river, and on the Lackawanna, the New York, Ontario, and Western, the Delaware and Hudson, and the Central of New Jersey railroads; 18 miles N. E. of Wilkesbarre. The city is the fourth largest in the State in population, and is the heart of the extensive anthracite coal section. It is built on a plateau in the Lackawanna valley amid beautiful scenery.

Business Interests.— Scranton has a large general trade, and is one of the chief points for the shipment of anthracite coal. The manufacture of iron and steel forms the principal industry. In 1900 there were 3 National and other banks in operation, and many daily, weekly, and monthly periodicals. The assessed property valuations aggregated nearly $23,500,000, and the total bonded debt was about $636,000.

Public Interests.— The city has an area of 19 square miles; 149 miles of streets, of which 18 miles are paved; and a sewer system covering 52 miles. The streets are lighted by electricity at a cost of nearly $45,000 per annum; the police department costs annually about $56,000, and the fire department $57,000. There is a public school enrollment of nearly 16,000 pupils, and annual expenditures for public education of over $383,000. The annual average death rate is 16.88 per 1,000. The city is laid out with wide streets; and has many driveways, squares, and parks. Among the public buildings are a court house, United States government building, College of St. Thomas (R. C.), St. Cecilian Academy (R. C.), Pennsylvania Oral School for the Deaf, Lackawanna Institute of History and Science, Albright Public Library, Welch Philosophical Society, and Taylor Hospital.

History.— The city was established in 1840 by George W. and Joseph H. Scranton. It was made a borough in 1854, and received its city charter in 1866. Pop. (1890) 75,215; (1900) 102,026; (1910) 129,867.

Scratch-back, a kind of plaything used at certain English fairs, which, when drawn quickly along the back of a person, makes a noise like that of tearing cloth, as if his coat were torn.

Screamer, in ornithology, a popular name for any individual of the South American family *Palamediidæ*. They have a

CRESTED SCREAMER.

horn on the forehead, and strong spurs on their powerful wings. They are gentle and shy, and the crested screamer (*Chauna*

chavaria) is said to be domesticated, and to defend the poultry of its master from birds of prey. *Chauna derbiana* is the derbian screamer, and *Palamedea cornuta* the horned screamer.

Screen, in ecclesiastical architecture, a partition of stone, wood, or metal to separate different parts of the building; as, the nave or an aisle from the choir, or a private chapel from the transept. The term is also applied to a partition extending across the lower end of a mediæval hall, forming a lobby within the main entrance doors, and having often a gallery above; also to a decorated wall inclosing a courtyard in front of a building.

Screw, in mechanics, a cylinder surrounded by a spiral ridge or groove, every part of which forms an equal angle with the axis of the cylinder, so that if developed on a plane surface it would be an inclined plane. The screw is considered as one of the six mechanical powers, but is really only a modification of the inclined plane. A convex screw is known as the external or male screw, a concave or hollow screw (generally termed a nut) is an internal or female screw. The mechanical effect of a screw is increased by lessening the distance between the threads, or by making them finer, or by lengthening the lever to which the power is applied; this law is, however, greatly modified by the friction, which is very great. The parts of a screw are the head, barrel or stem, thread, and point. The head has a slit, nick, or square. In number screws vary, as single, double, triple; the numbers representing the individual threads, and those above single being known as multiplex-threaded. A right and left screw is one in which the threads on the opposite ends run in different directions In making a screw, a large wire is drawn to the required size, cut a proper length, headed, and put into sawdust and "rattled" to brighten it. The head is then shaved down and the nick is put in at the same time. After "rattling" again in sawdust, the thread is cut by another machine, and the screw again "rattled" and dried.

Screw Nails, nails called in the trade "wood screws," and made from mild steel and iron; or from brass, copper, and zinc, when others would be destroyed by rust. Wood screws were in use long before the year 1760, when the brothers Wyatt obtained a patent for cutting screws by machinery. Before 1817, wood screws, being nearly all forged and then shaped by hand, were very expensive; but at that time a patent was granted to John Colbert, a German watchmaker, who made the first automatic machinery for this purpose. In the year 1854 a greatly improved machine was invented in the United States, which revolutionized screw making. These machines are complicated, and expensive in first cost and also to keep in operation. The wire is supplied to the heading machine, which cuts off a piece, and a blow from a die stamps a head on it. It is then turned and nicked, after which, in a worming machine, a cutter passes several times along the blank and forms the thread and gimlet point. One person can attend to several of these machines. Considerable success has been attained in rolling the threads on screw blanks. Two reciprocating plates, or revolving disks, are made from hard steel, and grooved at an angle; the screw blank is rolled between them under great pressure, receiving the reverse impression of the grooves which form the thread.

Screw Pine, in botany, the genus *Pandanus*. The name is given because the prickly leaves are arranged spirally in a triple series, forming dense tufts or crowns like those of the pineapple.

Screw Propeller, a spiral blade on a cylindrical axis, called the shaft or spindle, parallel with the keel of vessels, made to revolve by steam power beneath the surface of the water, usually at the stern, as a means of propulsion. In 1802, Shorter, an English mechanician, produced motion through the water by means of a screw, but his discovery had no practical value, and it was not till 1837 that its practicability was demonstrated by the American inventor, Captain Ericsson, since which time the screw has steadily gained in favor as a means of propulsion for vessels all over the world. In 1860 Messrs. Dudgeon, of London, England, constructed a steamer with twin screws, one under each quarter, having independent action, and imparting additional steering power. The motion of a screw steamer is more uncomfortable to passengers than that of a paddle boat, for the rapid revolution of the shaft produces a continuous vibration. In many cases, however, this is obviated in some measure by placing the saloon in the fore-part of the ship.

Screws, William Wallace, an American journalist; born in Barbour co., Ala., Feb. 25, 1839; studied law and was admitted to the bar in 1859; followed his profession till 1861, when he entered the Confederate army; participated in the capture of Fort Barancas and the navy yard at Pensacola; was promoted lieutenant of the 59th Alabama Regiment; was with Bragg's army in Kentucky and experienced much hardship at Chickamauga and Knoxville. During the last year of the war he fought with General Lee in Virginia; became a correspondent of the Montgomery "Advertiser" during his military service, after which he was placed on the editorial staff. Later he became president of the "Advertiser" Company, and also editor-in-chief.

He was secretary of state of Alabama in 1868–1872 and postmaster of Montgomery, Ala., in 1893–1897.

Scribe (Hebrew, *sofer*), among the Jews, originally a kind of military officer, whose business appears to have been the recruiting and organizing of troops, the levying of war-taxes, and the like. Later the Hebrew name *sofer* seems to have been especially bestowed on a copyist of the law books. After the exile, under Ezra, apparently the copyist became more and more an expounder of the law. In Christ's time the name had come to designate a learned man, a doctor of the law. Christ himself recognizes scribes as a legal authority (Matt. xxiii: 2); they were the preservers of traditions, and formed a kind of police in the Temple and synagogues, together with the high priests; and the people reverenced them, or were expected to reverence them, in an eminent degree. They were to be found all over the country of Palestine, and occupied the rank and profession of both lawyers and theologians. Their public field of action was probably threefold: they were either assessors of the Sanhedrim, or public teachers, or administrators and lawyers. Many of these teachers had special class-rooms somewhere in the Temple of Jerusalem, where the pupils destined to the calling of a rabbi sat at their feet. The calling of a scribe being gratuitous, it was incumbent on every one of them to learn and to exercise some trade. Those scribes who were not eminent enough to rise to the higher branches of their profession, to enter the Sanhedrim, to be practical lawyers, or to hold schools of their own, occupied themselves in copying the Book of the Law or the Prophets, in writing phylacteries, contracts, letters of divorce, and the like. Much of the "Halacha," "Haggada," and "Mishna" was due to them. As a rule they were PHARISEES (*q. v.*), and zealous to keep the law pure from any foreign influence, even CHASDIM (*q. v.*). Among famous scribes are to be reckoned Hillel, Shammai, and Gamaliel.

Scribe, Augustin Eugène (skrēb), a French dramatist; born in Paris, Dec. 24, 1791. For nearly 40 years he was the most conspicuous playwright living. His collected "Œuvres" (76 vols., issued 1874–1885) contain all his works, which include novels as well as plays. Among his plays are: "The Bear and the Pacha" (1820); "The Little Sister" (1821; "Valeria" (1822); etc. Among his comedies are: "The Silver Marriage" (1827); "Ambitious Men" (1834); "Comradeship" (1837); "The Glass of Water" (1840); "The Ladies' Battle" (1851); and "Fairy Fingers" (1858). He also wrote many well-known librettos. He died in Paris, Feb. 20, 1861.

Scribner, William Marshall, an American penman; born in Waterboro, Me., in 1824. He lived for many years in Boston, Mass.; took an active part in educational work in the West; and became widely known as the author of the system of penmanship copybooks bearing his name. He died in Chicago, Ill., Jan. 15, 1902.

Scrip (abbreviation of subscription), a certificate of loans or shares in a joint-stock company, forming a temporary acknowledgment of the holder's interest, and indicating the amount and date of each installment of the total subscribed or to be subscribed by him, the scrip being finally exchanged for a definite share certificate or bond.

Scripture, Edward Wheeler, an American psychologist; born in Mason, N. H., May 21, 1864; was graduated at the College of the City of New York in 1884; pursued special studies abroad; returned to the United States and was made director of the psychological laboratory of Yale University. His investigations resulted in several important discoveries, including a method of producing anæsthesia by electricity, a method of measuring hallucinations and imaginations, and the law of "mediate association of ideas." He also invented a color-sight tester by which color-weak or color-blind persons employed in lamp batteries, marine or railroad service, can be detected. His publications include: "Thinking, Feeling, Doing" (1895); "The New Psychology" (1897); and "Introduction to Experimental Phonetics."

Scrivener, Frederick Henry Ambrose, an English clergyman; born in Bermondsey, London, England, Sept. 29, 1813. He was graduated at Cambridge; was assistant master at Sherborne, head-master of Falmouth School from 1846 to 1856, and rector of Gerrans from 1861 till 1876, when he was made a prebendary of Exeter. He was one of the New Testament revisers from the beginning. His "Plain Introduction to the Criticism of the New Testament" (1861) was at once admitted to the rank of a standard authority. Among his other books are: "Bezae Codex Cantabrigiensis" (1867); "Cambridge Paragraph Bible" (1870–1871); "Six Popular Lectures on the New Testament Text" (1875); "Codex S. Ceaddae Lat. Eccl. Cath. Lich." (1887). He died in Hendon, England, Oct. 26, 1891.

Scrivener's Palsy, in pathology, a spasm or cramp affecting certain muscles essential to the act of writing. It commences by a stiffness of the muscles of the arm or forearm, or of the fingers of the right limb in the evening, disappearing after a night's rest; then the movement of the hand becomes unsteady and the writing a scrawl. At the more advanced stage a spasm comes on whenever the pen is taken

into the hand. Though it does not seem to be caused by overwork, yet the hand should be allowed to rest, and when work is attempted some mechanical appliance should be used to enable the fingers which are not affected to hold the pen. It is called also writer's paralysis and writer's cramp.

Scrofula, a tedious and multiform disease, hereditary in its nature, and one of the most characteristic marks of which is a tendency to swelling of the glandular parts, which sometimes suppurate, and discharge a curdy, mixed matter, and are very difficult to heal. The persons in whom scrofulous disease is most apt to manifest itself are marked during childhood by pale and pasty complexions, large heads, narrow chests, protuberant bellies, soft and flabby muscles, and a languid and feeble circulation. It, however, often accompanies a variety of the sanguineous temperament also, and is indicated by light or red hair, gray or blue eyes, with large and sluggish pupils, and long, silky lashes, a fair, transparent brilliancy of skin, and rosy cheeks. This red color is, however, easily changed by cold to purple or livid, and the extremities are subject to chilblains. Such children are often extremely clever and ready of apprehension, of eager tempers and warm affections, lively, ardent, imaginative, and susceptible. It is frequent, also, though less common, in what is called the melancholic or bilious temperament, *i. e.*, in persons of dark, muddy complexion and harsh skin, in whom the mental and bodily energies are more sluggish and dull. The disease, however, frequently occurs in persons who do not exhibit any of these symptoms. It is one of those diseases that are in a very marked degree hereditary. Like other hereditary tendencies, it may sometimes skip over a generation or two, and reappear, just as family likenesses do. The tendency may be so strong that no care will prevent its manifestation, or so faint as never to break out into actual mischief, if the exciting causes be warded off. Among the exciting causes are insufficient nutriment, exposure to wet and cold, impurity of the atmosphere, the want of natural exercise, and mental disquietude. Climate exercises a very marked influence upon it, and there is none more favorable for its development than our own. A moist, cold, and variable climate is particularly favorable to its development, while on the other hand a hot or a very cold climate protects against it.

It usually manifests itself in indolent glandular tumors, frequently in the neck, at first free from pain and inflammation, but proceeding slowly to an inflammatory state, and gradually and generally, after a long time, forming an ulcer, which is extremely difficult to heal. In some cases the eyes and eyelids are the principal seat of the disease, having constantly a very inflamed aspect. The bones of scrofulous persons are also liable to disease, especially those of the spine; and generally, the diseases and accidents that happen with comparatively little inconvenience to others are productive of very troublesome and alarming consequences in scrofulous constitutions. The lungs are particularly liable to attack in such cases, giving rise to the formation of tubercles in that organ which is so marked a feature in phthisis. The treatment consists chiefly in raising the tone of the system by moderate exercise in the open air, with suitable nourishment, sufficient clothing, and attention to the state of the bowels. Sea bathing, if it can be borne, or sponging the skin with tepid salt and water, followed by diligent rubbing with coarse towels and the flesh-brush, are very beneficial. Much good is frequently derived from the use of cod-liver oil; and iodine is often found to be of benefit.

Scroggs, Sir William, a British judge, whose name is used as a synonym for an unjust, venial, and brutal judge. He became chief-justice of the King's Bench in 1678, and was specially notorious for cruelty and partiality during the trial of the unfortunates accused of complicity in the alleged Popish Plot. In 1680 he was impeached by the Commons, but removed from office by the king on a pension. He died in 1683.

Scroll, a very frequent ornament in architecture, consisting of a band arranged in undulations or convolutions. The name is also given to the volute of the Ionic and Corinthian columns.

Scrophulariaceæ, in botany, pigworts or Linariads; an order of perigynous exogens, alliance Bignoniales: herbs, undershrubs, or shrubs, generally scentless; leaves opposite, whorled, or alternate; flowers, solitary or many, sometimes in dichotomous cymes; calyx inferior, in five or four divisions; corolla monopetalous, in five regular or bilabiate divisions, or in four, owing to the two upper petals being united at their tips; stamens sometimes two, but generally didynamous, from the abortion or absence of a fifth upper one (in very rare cases it remains fertile); style simple, rarely bifid; ovary superior, two-celled, many-seeded; fruit capsular, rarely berried; seeds generally indefinite, albuminous; found in all parts of the world. The species are generally acrid, somewhat bitter, and suspected to be dangerous. Tribes, Salpiglossideæ, Antirrhinideæ, and Rhinanthidæ. Known genera 176, species 1,814 (Lindley); genera 180, species about 1,800. (Sir J. Hooker.)

Scrub Bird, in ornithology, the genus *Atrichia.* The English name has reference

to its habitat, the dense scrubs of Western Australia, while its generic name records the absence of vibrissæ, so much developed in Sphenura, to which it is closely allied. There is but one species, *A. clamosa*, the noisy scrub bird, about eight inches long; upper surface, wings and tail brown, each feather with crescentic bars of a darker shade; throat and chest reddish-white, with a large irregular black patch on lower part of throat.

Scruggs, William L., an American diplomatist; born near Knoxville, Tenn., Sept. 14, 1834; was educated at Strawberry Plains College, East Tennessee, and admitted to the bar in 1860. He was engaged in newspaper work in 1862–1871; was United States minister to Colombia in 1871–1877 and 1881–1887; United States electrical engineer to Venezuela in 1889–1893; and legal adviser and special agent of the Venezuelan government during the determination of the Anglo-Venezuelan boundary in 1893–1898, in which capacity he aided in bringing the dispute to a pacific settlement by arbitration. His publications include: "British Aggressions in Venezuela, or the Monroe Doctrine on Trial"; "Lord Salisbury's Mistakes"; "The Colombian and Venezuelan Republics"; etc.

Scrutin d'Arrondissement (skru-ta*ng* da-rōn-dēs-män), in France, the system of voting whereby each *arrondissement* or district of a department returns its own member for parliament, each voter of the *arrondissement* having only one vote. *Scrutin de Liste*, on the other hand, is the system of voting whereby all the candidates for a department are put on the same list and returned at the same election.

Scudder, Horace Elisha, an American author; born in Boston, Mass., Oct. 16, 1838. From 1890–1898 he was editor of the "Atlantic Monthly." He published: "Seven Little People and Their Friends"; "Dream Children"; "Stories from my Attic"; "The Dwellers in Five Sisters' Court"; "Stories and Romances"; "Boston Town"; "Life of Noah Webster"; "A Short History of the United States"; "A History of the United States"; "The Book of Fables"; "The Book of Folk Stories"; "Fables and Folk Stories"; "George Washington: An Historical Biography"; "Men and Letters"; "Childhood in Literature and Art"; "The Bodley Books"; "Life of Bayard Taylor"; "Recollections of Samuel Breck"; "Literature in School"; "The Children's Book"; etc. He died Jan. 11, 1902.

Scudder, Samuel Hubbard, an American naturalist; born in Boston, Mass., April 13, 1837; was graduated at Williams College in 1857 and at the Lawrence Scientific School in 1862; was assistant to Prof. Louis Agassiz at the Cambridge Museum of Comparative Zoölogy in 1862–1864; secretary of the Boston Society of Natural History in 1862–1870; and its president in 1880–1887. He was palæontologist of the United States Geological Survey in 1886–1892. His publications include: "A Century of Orthoptera" (1879); "Catalogue of the Scientific Serials of All Countries" (1879); "Butterflies, Their Structure, Changes, and Life Histories" (1881); "Butterflies of the Eastern United States and Canada" (1889); "Catalogue of the Described Orthoptera of the United States and Canada" (1900); etc.

Scudéri, or **Scudéry** (sku-dā-rē), **Madeleine de,** a French author; born in Havre, France, June 15, 1607; became one of the most conspicuous figures in the literary circle of the Hôtel Rambouillet at Paris, and acquired great fame by her romances: "Artamenes, or Cyrus the Great"; "Ibrahin, or the Illustrious Pasha"; "Clélie"; Alamahide"; and others of almost interminable length. They were the reflection of the society in which she moved. She wrote also, "Conversations"; "Fables"; and "Light Verses." She died in Paris June 2, 1701.

Scudo (plural, **Scudi**), the former monetary unit in the Roman States; divided into 10 paoli or 100 bajacchi, equal to about $1.02. It is now superseded by the Italian scudo of 10 lire ($1.93), which assimilates it to the French system; also an Austrian silver coin worth about $1.02, a Neapolitan silver coin worth about 96 cents, and a Genoese gold coin worth about 96 cents.

Sculptors, American. The works of American artists occupied the central and most conspicuous place in the great glass rotunda devoted to sculpture in the Palais des Beaux Arts at the exposition of 1900. Next to France itself, America carried off the most medals and awards.

That this last should have been the case is a striking exemplification of the artistic development of our country within the last decade. Not only was American sculpture very sparingly represented in 1889, but only one man then, Paul Bartlett, showed work of incontestably great merit. In 1900 our exhibit in point of size was still to that of France only as is a pygmy to a giant. It is well for us to realize that it was composed of the works of only 31 men, while the French exhibitors numbered over 300; moreover, while the level of talent among Americans was indisputably high, the average standard in conception and execution among the French was no less so. But enough originality and individuality characterized the ensemble of the American work to make it stand out among that of all the other countries, and it was seen that we had certain sculptors of great distinction. The

Sculptors

chief interest of any international exhibition lies in its opportunity for comparison. And the Palais des Beaux Arts brought together and placed side by side three men who, each in a very different fashion, realize an ideal in sculpture,—the Frenchman Rodin, the Belgian Constantin Meunier, and the American Saint-Gaudens. It was a great triumph for America that for many of the most intelligent critics Mr. Saint-Gaudens was the most complete of these three.

To understand this point of view we must look at the works of these great men not as individual achievements in sculpture, but comparatively in their relation to the ideal in their art. M. Rodin has never shown himself to be an all-round sculptor, and the separate Rodin exhibition proves this still more conclusively. That is to say, Rodin is not a sculptor uniting form with thought like Michael Angelo. He makes living things, he translates nature into art. When he tries to synthesize his mental impressions, to unite a great number of these into one work, he is not entirely successful, as in his much-discussed statue of Balzac.

M. Constantin Meunier, on the other hand, does not give an impression of life. He does not seem to have a strong feeling for form. His principal work at the exhibition, "La Moisson, La Terre," "The Harvest, The Soil," a large high-relief representing a group of harvesters in a field of ripened grain, was a masterpiece because of the loftiness of his idea, through his great conception of manual labor as the link uniting man to the soil, interpreted in a work of art of extreme poetic beauty. But it did not give the feeling of life. His figures were symbols, and not living men and women.

In Mr. Saint-Gaudens we found the same *recherche de la vie,* the constant seeking after life, that we saw in M. Rodin, and the lofty thought of M. Constantin Meunier. He added also a third element which was of the deepest interest to foreign critics, as it is to Americans, and that is that all his work bore such a strong impress of the spirit of his country. If we examine his exhibits at the Grand Palais, we shall see that with a feeling for form like that of the Greeks, and the love of movement which is so characteristic of modern sculpture, they embody the most marked of all our American traits —vigor, energy, will power, resolution, patriotism, and the sentiment of the independence of man.

The great standard of a work of art is simplicity. The great man in any art is he who can create something that is simple, and yet with this simple thing give a fine and elevated emotion. The literary artist achieves this through the tact with which he chooses his words and facts and arranges them in a certain order. And in Saint-Gaudens' statue to General Sherman, which was his principal exhibit at the exposition, the power which moves us may be explained in the same way. The life in it first arouses us, steed and rider give an impression of advancing in a fine onward movement which we feel in every detail; in the arch of the horse's neck, for instance, the flap of the military cape blown back by the wind. The group is a joy because of its splendid modeling, but through an infinity of means the sculptor has given it more than that. He has made every line in the general's stern, spare figure and grave, beautiful face full of psychological suggestion. You read in its simplicity, so devoid of anything melodramatic, of all the ordinary panache of military glory, singleness of purpose, resolution, heroism, patriotism, all the finest qualities belonging to man, and the heart thrills responsively as it recognizes them. The winged Victory is Greek art transformed by an American temperament and the special impress of his country. The symbol takes the shape of the eternally alluring female form, but the type is American. The figure has the particular distinction, fearlessness, and purity of the American girl, and even a little of her stiffness.

Mr. Saint-Gaudens has profited by the sculpture of other countries, and at the same time remained peculiarly of his own. You see this in all his work. In the "Shaw Monument" there is the same astonishing life and movement that there is in the statue to Sherman. You fairly hear the beat of the soldiers' feet as they march past, and from it breathes the same lofty sentiment of patriotism. "The Puritan," again, is a symbol, a figure capable of reviving a whole epoch of our national history. The continuity of everything which exists, to my mind, can be preserved more fully by sculpture than in any other way. Suppose for a moment that every historical record in America and everything in writing bearing upon its history should be lost during the course of the ages, the exact spirit of two periods at least could be seen through these statues of Mr. Saint-Gaudens.

His defects, in the eyes of the best æsthetic authorities abroad, arise from his very qualities. He is apt to give a little too much importance to details, and he sometimes loses in largeness of treatment by this. Detail that is carried too far becomes petty. In the single impression given by a great and noble statue like the General Sherman, your attention is distracted rather than engaged by such care of details as is shown in the lines in the horse's neck. But the exposition would have placed Mr. Saint-Gaudens, if he had not held that position before, among the greatest of living sculptors. What is the constant wonder of his contemporaries is the extraordinary capacity for freshness of impression that he has

been able to keep. The secret of it, I think, is in the fact that he has always kept his mind and soul apart from everything that was common and vulgar, and that therefore he has vibrated only to all that was best and finest in our national life.

One thing which the international exhibition brought out very clearly was the fact that no country was preëminent in sculpture which did not possess a great sculptor. Italy has no great sculptor, and the exhibit of this country, which, from the 14th to the 17th century, led the world in this branch of art, was almost entirely without interest. Neither had Germany an exhibit of importance, nor Spain nor England. Such sculptors as Chapu, Frémiet, and Rodin in France, Constantin Meunier in Belgium, and Saint-Gaudens in America have raised the whole standard of sculpture in their respective countries.

Mr. Mac Monnies, the other American sculptor, who with Mr. Saint-Gaudens received the Grand Prix at the exhibition, is an artist of extraordinary virility, versatility, and erudition. He does not stand apart like Mr. Saint-Gaudens. His great bas-reliefs, "The Army and the Navy; the Heroes of the War of 1861–1865," from the triumphal arch of Brooklyn, are magnificent groups, full of the intensity of war, of the martial spirit expressed with force in comprehensive detail, but they are not as great as the "Chant du Déspart," by Rude, on the French Arc de Triomphe, by which they have evidently been inspired. Mr. Mac Monnies does not stand among his contemporaries as a personality working from an individual inspiration, but rather as a sculptor of the highest culture with many ideas and absolute knowledge and command of all the possibilities of developing them. But how many sculptors are there in the world who could show side by side a work of the robust power of his group of horses — even though these may suggest the horses at Marly-le-Roi and may not be so good as these last — and the charm of the "Bacchante"?

Paul Bartlett, medaled in 1889, and therefore member of the jury and *hors concours* in this exposition, is another man who held a high place of honor in the American group. Mr. Bartlett's talent, to my mind, is never best shown in his large statues which sometimes, as in the "Michael Angelo" of the Grand Palais, lack simplicity and grandeur, but the "General Lafayette" unveiled in Paris July 4, 1900, is one of the fine statues of the capital. It is full of movement, splendid in its modeling, and a work of great distinction and elegance.

George Gray Barnard is one of the sculptors who was most noticed because of his marked individuality, his fashion of transforming the antique according to his own temperament, evidently strongly imbued with the American spirit of originality. This was especially seen in the "God Pan," placed out of doors near the Pont Alexandre III. From all time the French conception of the god Pan has been a little Monsieur with horns on his head, while Mr. Barnard's Pan was a vague divinity embracing all nature, a strange, bizarre god, very much such a one as Edgar Poe would have conceived if he had undertaken to give his personal vision of Greek antiquity. The statue received a gold medal, and was a distinctly American triumph.

John Flanagan, one of Mr. Saint-Gaudens' best pupils, was another sculptor who, in his fine "Head of an Athlete," also interpreted the antique through an American temperament. His "Swift Runners," a beautiful bas-relief in which the racer whose forces were spent was handing a lighted torch on to his successor, is a work full of poetic symbolism and charm. Mr. Borglum in his "Horse and Indian" showed a piece of strong life-like sculpture, particularly interesting in composition, which was full of American spirit. Both he and Mr. Flanagan were silver medal men. Mr. Rondebusch, again, in his life-like "Wrestlers" gave an American version of an antique subject. Mr. Brooks in the "Statue of General Cass" and "The Song of the World" showed himself a brilliant artist. H. A. MacNeil was original in conception and strong in execution in "The Sun God." Bitter, Procter, Breuner, Graply, Mrs. Vonnoh, Mlle. Kuhne Beveridge, and Miss Enid Yandell all had exhibits of interest. In most of these, however, we found ourselves in the domain of three-quarters of the French sculptors, men who were perfect artisans in art, but not artists. The difference between the two is that the artist is capable of conceiving a great thing and executing it. The artisan has only the power of execution.

The conclusion that America may draw from the sculpture exhibit of the exposition of 1900, if we may draw a conclusion, is that we must not have the idea that art, and sculpture in particular, is to be learned in France. Its source is in the individual soul of the artist, and the American who would reach the highest mark in it must first see to having a *belle âme Américaine.*

KATHERINE DE FOREST.

Sculpture, the art of cutting or carving any material so as to represent form. If taken in a broad acceptation, the term might be applied to gem engraving, casting in metal or otherwise, modelling, and carving generally. Sculpture may be broadly divided into relievo and round. In the former, single figures or groups are represented as more or less raised, but without being entirely detached from a background. According to the latter method, insulated figures, such as statues, or collections, or groups, are made, so as to be entirely independent of a background.

The origin of sculpture is lost in antiquity. An admirable material for early effort was found in clay, so widely diffused in many lands, to which, as knowledge advanced, were added wax, gesso, marble, alabaster, bronze, etc. Hence the rudiments of sculpture are found among all races of mankind. The idolatry of the Old World gave it a great impulse, from the necessity which it produced of representing gods. The history of sculpture is almost the history of religion. In the inspired writings, the Israelites are repeatedly exhorted to turn away from the worship of images, the sculptured works of their own hands. Sculptured works have been found in the most ancient Hindu caverns and grotto temples. In the ruins of Persepolis there are many examples attesting the fact that the Persians possessed many works of sculpture, yet they never carved the semblance of the human form. Sculpture flourished in Assyria. The museums of London and Paris contain colossal slabs, the dates of which range from the time of Sardanapalus, 930 B. C., to the destruction of Nineveh, 625 B. C. In these emblems of the sculptured arts of a great and ancient people we find human-headed winged bulls and lions, and representations of battles, sieges, and the chase. Probably because their creators were bound by rigid conventional rules, these slabs show a total ignorance of perspective, together with exaggerated and inaccurate drawing. The Egyptians were the first who elevated sculpture almost to pure art. This ingenious, wealthy, and wise people, nevertheless, were never able to shake off a heavy uniformity and stiffness which characterized all their works, and rendered them vastly inferior to the Greeks. The Egyptian sculptors always wrought under the direction of the priests, who, according to Plato, never suffered them to innovate anything in their art, or to invent any new subjects or any new habits. Formal, limited action, drapery without folds, flat eyebrows, thick lips, and projecting eyeballs, are the prevailing characteristics in all Egyptian sculpture, albeit there is a peculiar sweetness of expression in many of their heads. Some authorities hold that the Etrurians taught the Greeks, while others declare that the Greeks were the instructors of the Etrurians. Certain it is that the sculptured remains of the Etrurians were closely connected in style with the Greek, pointing to the fact that there must have been some connection between the two nations. The Etruscans were mostly skilled in the making of vases. Their sculptured works were chiefly in bronze, stone, and terra-cotta. In Greece the art of sculpture soon rose superior to all those impediments which trammeled and restricted its advancement in other countries.

Sculpture

Writers have endeavored to account in various ways for the universally admitted superiority of the Greeks over every other nation by whom the fine arts have been practised, and usually have attributed their success to such physical causes as a fine climate, the prevalence of beautiful forms, or to the public exercises so general in that country. The Greeks had an intuitive sympathy with beauty, either in poetry, painting, or sculpture. Sculpture in Greece, as elsewhere, had its beginning in very rude forms. At first the symbols of divinity were little more than rude quadrangular blocks of stone. Between the 9th and 7th centuries B. C. the Greeks had frequent intercourse with the commercial Phœnicians. From this nation the Greeks borrowed their Hermæ, or god of roads and travelers; at first mere stone pillars. On these pillars a head was afterward placed, thus forming the origin of busts. Progressing still further, sculpture was called on to assist in the decoration of temples. Hands and feet were next added, a shield and spear were placed in the hands of the statues; and thus the first semblance of Pallas originated. Till the time of Dædalus of Athens, the bodies or trunks of large statues were a mere cylindrical pillar, as in the Colossus of the Amyclean Apollo. Dædalus inaugurated a new era; and of his divine genius the Greeks said that he made statues walk, see, and speak. After this great master it was that all artists were symbolically termed Dædalides, the sons of Dædalus. Henceforth, ancient Greek art may be divided into three styles: the Old Attic, the Æginetic, and the Etrurian. Statues, thrones embellished with figures, shields, vases, and coffers, were the productions of the art. Smilis, the father of statuary, lived at Ægina about 1400 B. C.; and in 700 B. C. Rhœcus of Samos invented the art of molding and casting in brass. The famous "Brazen Bull" was made by Perillus for Phalaris, who reigned in Sicily 564 B. C. But the true ideal style of Greek art was not inaugurated till the time of Phidias. This great genius lived in the time of Pericles, the age of classic models. For the Parthenon at Athens, Phidias wrought the statue of Minerva, and at Elis he set up his other great masterpiece, the famous Olympian Jupiter. Both were executed in ivory and gold. The god Jupiter was 40 feet high; his face bore the expression of power, wisdom, and benevolence; and an epigrammatist, speaking of his majestic proportions, said: "The statue of Jupiter would have thrust off the roof of the temple like a thin shell if it had ever risen from its golden throne." This statue of the Olympic Jupiter existed till the year 475 of our era, when it was destroyed by fire at Constantinople. Besides these great works he made a statue of Pallas in brass,

for Athens, the Venus Urania, the Nemesis in the temple at Marathon, and an Amazon, famed throughout Greece for the beauty of her limbs. Alcamenes of Africa, and Agoracritus of Paros, were his favorite disciples. The most famous works of Alcamenes were his Mars, Cupid, Venus, and Vulcan. It was said that Agoracritus was even superior to Alcamenes, and when he contended with the latter in the execution of a statue of Venus the Athenians only adjudged the prize to Alcamenes out of partiality for their fellow-citizen. According to Varro, the Venus of Agoracritus was the finest ever wrought. Polycletus of Argos was the author of the work deemed worthy of being ranked as the companion to the Jupiter of Phidias. This was the celebrated statue of Juno. Tenderness and softness were the characteristics of this master. He excelled in portraying the beautiful positions of the boys of the gymnasia and of the sports of youth. His works were chiefly in metal, and he was the author of the celebrated ideals of youthful beauty — the Diadymenus, a placid youth, who winds the wreath of victory around his brow; and the warlike Doryphorus, holding the lance. Myron of Eleutheræ, in Bœotia, was the great rival of Polycletus. Despising the soft and graceful forms which his contemporary sculptor loved to represent, Myron sought his models in the brawny athlete. He sculptured the ideal Hercules, the Discobolus throwing the discus. He was no less famous for his animal forms, the most celebrated of which were the Heifer and the Sea Monster. In one quality, however, he was surpassed by Pythagoras of Rhegium, who executed the ideal of Apollo, who, as an archer, has just shot the serpent Python. The finest statue possessed by the moderns is an imitation of this great work, the Apollo Belvidere.

With Socrates, the sculptor of the Draped Graces, and ATHENODORUS (*q. v.*) and Nancydes, commenced the third epoch of Greek sculpture. It is generally known as the beautiful style, and Scopas, Lysippus, and Praxiteles, because they united beauty and grace, brought the art to its highest perfection. The finest works of Scopas were the Furious Bacchante, his Venus (the original, perhaps from which the Venus de Medici was copied), and the Triumph of Achilles, together with a number of charming combinations of Nereids and sea monsters. PRAXITELES (*q. v.*) wrought in bronze and marble. Till this sculptor ventured to carve a Venus nude, all statues of female divinities had been draped. The rival and contemporary of Praxiteles was Lysippus of Sicyon, who was the great master of portrait sculpture. He is said to have executed in bronze exclusively. Alexander the Great would permit no other artist to carve his likeness. He represented Alexander from his childhood to his manhood. Pliny declares that Lysippus executed as many as 610 works. His horses were very beautiful. The other great sculptors of this period were Euthycrates and Bedas, sons of Lysippus; Xenocrates, who wrote a treatise on sculpture; Charles of Lindus, who cast the famous Colossus of Rhodes; Agesander of Rhodes, and his three sons, who executed the celebrated group of Laocoon; Glycon of Athens, who formed the Farnese Hercules at Naples; and Appollonius and Tauriscus, who made the Farnese Bull, also at Naples. The beautiful fragment known as the Torso of the Belvidere, at Rome, and the Hermaphrodite at Paris, also belong to this era of Greek art. From an early period, and even during the best era of Greek art, the age of Phidias, the Greeks were accustomed to combine different marbles in the same work. This was called polylithic sculpture. Frequently, head, hands, and feet, were formed of different stones, while wood and metal were employed for the draperies and accessories. The Greeks also painted their statues. The hair was often gilt, and even colored sometimes; the backgrounds of alti-relievi were painted in order to heighten the effect, and occasionally eyes of glass or silver were introduced.

The victorious Romans destroyed the existence of the arts in Greece; but all the great works in painting and sculpture were taken to Rome, and with these masterpieces the artists emigrated to the capital of their conquerors. The celebrated reclining statue of the Dying Cleopatra was executed in the reign of Augustus, and a son of Cleomenes the Athenian made a statue which is held by some to be a figure of Germanicus. This work is now in the Louvre at Paris. Julius Cæsar was devoted to the fine arts, and even the most remote provinces of the Roman empire reaped the fruits of his refined taste. He embellished the cities of Gaul, Spain, and Greece, as well as Rome. Augustus ornamented all the public places of Rome with statuary, and Agrippa employed an Athenian sculptor to decorate the Pantheon, as well as causing an aqueduct to be embellished with 300 pieces of statuary in bronze and marble. Nero invited from Cisalpine Gaul, Zenodorus, who executed a colossal bronze statue of his patron, 110 feet high. It was during the reign of the last-mentioned emperor that the Romans began to introduce the practice of making statues in different colored marbles. The times now became too disturbed for sculpture to flourish; but it revived under Trajan, in whom, as well as in his successors, Adrian and the Antonines, the art found a munificent patron. Adrian was especially conspicuous for his fine taste. He caused to

be restored all the old public edifices that had fallen into decay, besides erecting many new and magnificent buildings. The remains of one fine work remain to this day to attest his munificence — the grand villa near Tivoli, about 18 miles from Rome. After this prince sculpture began to decline, and when the seat of imperial government was established at Constantinople, Constantine could find no artists worthy to decorate his new imperial residence. After Rome had been destroyed by the several inroads of the Northern nations, the finest productions of ancient art were demolished, and this work of destruction was consummated by the religious zeal of the primitive Christians, who swept away what remains there were of the statues of the Greek and Roman divinities.

Sculpture awoke to renewed life about the 10th or 11th century in Italy. Niccolo Pisano, who died 1270, is esteemed the "father of modern sculpture." Two of his finest compositions are the Taking down from the Cross, in front of the Duomo of Lucca, and the Last Judgment and Punishment of the Wicked, in the cathedral of Sienna. Both these masterly works are bassi-relievi. Andrea Orcagna, poet, painter, and sculptor, died in 1389. Lucca della Robbia covered his beautiful terra-cotta models with a varnish which gave them the hardness of stone. Lorenzo Ghiberti and Donato di Betto Bardi were distinguished masters of sculpture. Michael Angelo declared that the brazen gates made by the former were worthy of being placed at the entrance to Paradise. Donatello, who died in 1466, enriched Florence, Genoa, and Venice, with his works. During the 15th century Andrea Verocchio, Andrea Ferracci, the two Pollajoli, and Mina di Fiesole, were great masters. Michael Angelo Buonarotti was the greatest sculptor of this period. Baccis Bandinelli, born at Florence in 1487, attempted to become the rival of Michael Angelo. A great anatomist, his style was rude and energetic. He restored the right arm of the Laocoon. Benvenuto Cellini was a Florentine sculptor; most of his finest large works, which were cast in bronze, are preserved in his native city. The one celebrated female sculptor is Dropozia di Rossi, of Bologna, who died at an early age in 1530. Guglielmo della Porta, Bernini, Alessandro Algardi, of Bologna, Il Flammingo, a native of Brussels, who excelled in portraying the forms of childhood, Francesco Mocchi Faggini, and other names, mark the different eras of Italian sculpture down to the present century.

To Flaxman, the English are indebted for founding on true principles the British school of sculpture. This great sculptor has had worthy followers in Sir R. Westmacott, Sir F. Chantrey, Bailey, Carew, Lough, and Foley, Woolner, and Boehm. In France, Jean Goujon, of Paris, is the first distinguished sculptor. The brothers Marsy, who cast the statues of Bacchus and of Latona, and the famous group of horses at the Bath of Apollo at Versailles, were distinguished in the 17th century; also, Guillain, Franqueville, Anguier, and Puget. Baptist Pigalle executed a Mercury and a Venus for the King of Prussia. David (d'Angers) and Pradier belonged to the French school of the 19th century, and, among later sculptors, Guillaume, Carpeaux, Bartholdi, Dubois, Chapu, Mercie, Barge, Fremiet, Dalou, Falquière, and Rodin, take high rank.

Among modern German sculptors, Christian Rauch and Dannecker take high rank. As Canova emancipated modern Italy from those false perceptions which had so long diverted the current of pure taste, so Thorwaldsen, the Danish sculptor, was superior to all his contemporaries in the grandeur of his forms and in strength of expression. John Gibson was the most distinguished pupil of both Canova and Thorwaldsen. Few American sculptures worthy of note were executed previous to Greenough's time, but since his day the names of Hiram Powers, Crawford, Brown, Clevenger, Rogers, Palmer, Miss Hosmer, Story, Saint Gaudens, Ward, MacMonnies, French, Hartley, Partridge, have been added to the list of American sculptors.

In the mechanical process of sculpture, the artist having conceived his subject, either makes a preliminary sketch of it on paper, or else proceeds at once to model it on a small scale in clay or wax. By this means he is enabled to improve the general arrangement of his figures. The genius of the artist is altogether displayed in the perfected original model, for the subsequent process of copying it in stone is chiefly mechanical. When a large clay model is made, a skeleton or frame of wood or iron is constructed whereon to place a proper quantity of wet clay. This clay is molded by the hand, and by tools of wood and ivory. The figure is thus built up in clay, and whether it is subsequently to be draped or otherwise, it should always be modelled naked, so that the true proportions of the form may be attained, also that the drapery may have a natural curve and fall. If the design be in "relievo," a plane is prepared on which the design is drawn. On this sketch, bounded by the outlines, the wet clay is laid; afterward the clay is modelled by the sculptor. In either case, whether in the "round" or in "relievo," the clay must be kept damp by wet cloths, in order to prevent the shrinkage or cracking of the model. To obtain a cast of this model is the next process. The model is covered with a mixture of plaster of Paris and water, and when this has become hardened, the clay

model within is carefully picked out. The plaster of Paris matrix is then washed; the interior is brushed over with a composition of oil and soap, and a fresh supply of plaster of Paris poured in. When this sets, the matrix is struck off, piece by piece, with chisels, and a cast of the model, which has not adhered to the mold by reason of the oily compound with which the latter had been smeared, is obtained. This cast is the exact fac-simile of the original model, and if it is intended to execute the work in bronze, another mold is taken from it by the founder. If it is intended to copy the work in marble, a block of marble is marked with a number of pencil points, to correspond to the chief elevations and cavities in the figure to be imitated; these forming a series of guides to the workmen engaged in carving a rough outline of the original work. A superior workman next copies the nicer details of the work by means of chisels, rasps, and files, the pencil points acting as his guide. Finally the sculptor himself gives the finishing touches, and goes entirely over his work, improving each detail. When required, the surface is polished with pumice stone and putty powder.

Sculptured Stones, a general name given in Great Britain to a class of monuments of the early Christian period, many of them being mere unhewn stones, with sculpturings of rude inscriptions, or symbols, or ornamental designs, corresponding in style and patterns to the illuminated decorations of Celtic manuscripts of the Gospels. The rude stones erected for memorial purposes in pagan times (unless under Roman influence) are uninscribed and unornamented (see STANDING STONES). The sculptured stones of Great Britain may be divided into two classes — those that are simply incised and those that bear sculpture in relief, the former being the earlier method. Sculptured stones of the incised or earlier class may be subdivided into two sections, inscribed or uninscribed, irrespective of their bearing symbols and ornamentation. The advantage of this division is that the inscribed monuments can be arranged in chronological order by their palæographical characteristics, and the uninscribed examples bearing similar symbols and ornamentation to those found on the inscribed examples will follow the same sequence. We know from palæographical data that the earliest lapidary inscriptions in Great Britain are in Roman capital letters, and that the minuscules, or small letters, do not make their appearance till about the 6th century. Hence we have a means of dividing the inscribed stones into an earlier and a later group according as they are written in capitals or minuscules, while those that are mixed or partly in capitals and partly in minuscules will represent the middle or transition period. But many of the inscribed monuments bear inscriptions which are written in a character peculiar to the British Isles, and known as Ogam. Sometimes the Ogam inscription is associated with an inscription in Roman letters on the same stone, sometimes the monument bears an Ogam inscription only. In the latter case it is frequently associated with sculptured ornamentation in relief of the most advanced type, and therefore we have another means of dividing the inscribed stones into two groups, one of which is demonstrably later than the other. Of these four groups, which are: (1) inscribed in Roman capitals only; (2) inscribed in Roman letters and in Ogams, or bilingual and biliteral; (3) inscribed in Ogams only; and (4) inscribed in Roman minuscules or small letters, the first and second have their chief development in Wales, and the third and fourth in Ireland.

Of the first group of sculptured stones there are 60 in Wales, 23 in England, 6 in Scotland, and none in Ireland. They are in general rude undressed pillar-stones or oblong bowlders from four to nine feet in height, the inscriptions generally incised vertically. They are always in the Latin language, and usually consist of the name of the deceased, preceded by one or other of the varieties of the distinctively Christion formula "*Hic jacet,*" etc. The greater number of these stones are found in association with ancient ecclesiastical sites, and some bear also incised crosses of the earliest known type. A well-known example is the Cat Stane near Kirkliston, Midlothian. which stands in a cemetery of early Christian graves, and bears the inscription, IN (H)OC TVMVLO JACIT VETTA F (ILIUS) VICTI. One of a group of three at Kirkmadrine in Wigtownshire commemorates two priests, Viventius and Mavorius, probably of the church founded there by St. Ninian in the 5th century. The greater purity of the forms of the letters and the style of the Latin of the inscriptions of this group indicates their closer proximity to the period of the Roman occupation. The characteristics of the second group of inscribed stones is that they bear two inscriptions, one in the Latin language and in Roman letters (capitals as a rule), and the other in the vernacular in Ogam letters, one inscription being always an echo of the other. Of these bilingual monuments there are 18 in Wales, 2 in England (both in Devon), 2 in Ireland, and 1 in Scotland, at Newton of Garioch in Aberdeenshire. Two examples will show the general character of their inscriptions. One in Pembrokeshire has, in debased Latin capitals, SAGRAMNI FILI CVNOTAMI, reading from the top of the stone downward on one face, and on one

edge the answering inscription in Ogam letters, SAGRANI MAQI CVNOTAMI, *maqi* being the usual form in these inscriptions for son. Another in Carmarthenshire reads in Latin AVITORIA FILIA CVNIGNI, while the answering Ogam has AVITORIGES INIGINA CUNIGNI — *inigina* standing for daughter, and answering to the modern Gaelic *ingen*, as *maqi* answers to *mac*.

The third group of inscribed monuments, those bearing Ogams only, lies chiefly in Ireland, where there are 186 examples. There are only 22 in Great Britain, of which 12 are in Scotland, 6 in Wales, and 4 in England. Twenty-three of the Irish examples are associated with early forms of the cross incised on the same stone. In Scotland 6 occur on stones bearing crosses of Celtic ornamentation of a late type, and in Wales 6 are on stones bearing incised crosses. From their nature these Ogam inscriptions are peculiarly difficult to decipher; but when the reading is clear they are usually of the same brief character as the bilingual inscriptions of the group previously described. The fourth group of inscribed monuments comprises those in minuscules or small letters of the Roman alphabet, chiefly in the forms of those letters adopted by the Irish scribes. Of such inscribed stones there are about 260 in Ireland, 42 in Wales, 12 in England, and only 3 or 4 in Scotland. The largest group in Ireland is in the ancient cemetery of Clonmacnois, where there are over 80 examples, many of which can be dated by the names of the persons commemorated. They are chiefly undressed slabs laid flat on the graves, and incised sometimes with the inscriptions only, sometimes also with crosses, and more rarely with Celtic ornamentation. Of the names which can be identified from the Irish annals 4 belong to the 7th century, 6 to the 8th, 28 to the 9th, 18 to the 10th, and the same number to the 11th century. The earliest bear nothing but the inscriptions and plain crosses. Ornamentation does not begin to be added till the 9th century. In Ireland the inscriptions are usually in the vernacular with the formula *oroit do* —— and its contractions, or *oroit ar anmain* —— and its contractions, meaning "pray for ——" or "pray for the soul of ——." In Wales, however, the inscriptions of this group are usually in Latin.

Though the majority of these stones are sepulchral monuments, others have been erected for different purposes, commemorative or terminal, to mark the boundaries of church lands or sanctuaries. In the Anglo-Saxon parts of Great Britain the inscribed stones bear inscriptions in Anglian runes, and in the Isle of Man and the N. and W. isles of Scotland, colonized from Scandinavia, the inscriptions are in Scandinavian runes. The monuments with Anglian runes are chiefly sepulchral slabs of small size, incised with a cross and the name of the deceased. In a few cases, however, they are great commemoration crosses, covered with sculptured ornamentation and bearing elaborate inscriptions. The finest of these crosses are at Bewcastle in Cumberland and Ruthwell in Dumfriesshire. The shaft only of the Bewcastle cross remains, 14½ feet in height; the Ruthwell cross measures 17½ feet in height. Both are so similar in design and in style of ornamentation that they must be attributed to the same period. Both have long runic inscriptions — that on the Ruthwell cross being associated with a series of inscriptions in Roman capitals descriptive of the scriptural scenes carved on the panels of its two broad faces, while the runes are on the borders of the long panels on the sides of the cross, enclosing scrolls of foliage. They contain 21 lines of an Anglo-Saxon poem — "The Dream of the Holy Rood" — which was not known to exist in any other form till a South Anglian version was discovered in a manuscript at Vercelli in 1823, and attributed to Cynewulf, though Professor Stephens of Copenhagen maintains that a line of runes on the top of the cross, now obliterated by exposure, gave the authorship to Cædmon. The inscription on the Bewcastle cross is less legible, and has been read as recording its erection in honor of Alcfrith, King of Northumbria, in the 7th century, though the opinion is gaining ground that the dates of both these crosses must be placed considerably later than his time.

The monuments included generally under the name of the sculptured stones of Scotland are for the most part uninscribed. But they are profusely decorated and their chronological place in the general group of the early Christian monuments of Great Britain falls to be determined partly from the relations of their general system of ornamentation to that of the illuminations of the Celtic manuscripts of the Gospels of the 7th to the 10th and 11th centuries, and partly by the characteristics of the few inscriptions they do bear. Taken by themselves, they exhibit peculiar characteristics, which show that, though they form part of the general group which is peculiar to the British Isles, they have been affected by strong local influence. They present a peculiar set of symbols, not one of which is known to have occurred beyond the Scotch area, while the special form of the erected cross-bearing slabs, and partiality to the representation of conventional beasts as part of their decoration, distinguish them from the English, Welsh, and Irish groups. The Scotch sculptured stones, of which over 370 are known, are divided into three varieties: (1) Rude undressed pillar-stones or oblong

bowlders incised with unexplained symbols, (2) Erect shaped slabs of headstone form, sculptured generally in relief, with a cross on one face and figure subjects and symbols on the other. (3) High crosses with figure subjects and Celtic ornamentation similar to those of the cross-bearing slabs, but without symbols. The rude pillar-stones of the first variety occur chiefly along the E. side of Scotland from the Firth of Forth to the Orkney and Shetland Isles, being most numerous in the district between the Tay and the Spey. Outlying examples, however, occur as far S. as Dumfriesshire and as far W. as the outer Hebrides. The unexplained symbols incised on these stones are more easily represented than described. Some of these are arbitrary symbols, to the development and meaning of which there is no clue. Others — such as the serpent, and the mirror and comb — are representations of existing objects, apparently used with a symbolic meaning. Some of the arbitrary symbols occur also on silver ornaments of the same period. On stones of the second variety, sculptured in relief, and presumably of later date, these symbols are associated with well-known symbols of the Christian faith, such as the cross and the fish, and with the ornamentation so characteristic of the illuminated pages of Celtic manuscripts of the Gospels. The figure subjects on the stones of this variety are partly Scriptural and mostly related to the general cycle of early Christian symbolism. Among the scriptural subjects are the Temptation of our First Parents by the Serpent, Daniel in the Den of Lions, the Destruction of Pharaoh's Host in the Red Sea, the Raising of Lazarus, Jonah disgorged by the Whale, the Virgin and Child, etc. Along with these are hunting scenes, including the chase of the stag, wild boar, etc., and groups of animals evidently taken from the Bestiaries of the early Middle Ages, a species of natural history spiritualized, in which the characteristics of the various animals, real and fabulous, were set forth as symbolizing the spiritual condition of man as related to the Scriptural plan of salvation. Of the third class of sculptured stones, the high crosses, there are but few in Scotland, and they are nearly all characterized by the presence of Scriptural subjects. There are no data by which the age of the stones of the first variety, bearing only the incised symbols peculiar to Scotland, can be estimated. But there seems no reason for assigning to them a higher antiquity than that of the inscribed stones of the first and second classes, which seldom bear ornamentation or symbols, except the early form of the cross. The style of the ornamentation of the second variety, sculptured in relief and arranged in panels, is similar to the decoration of the illuminated Celtic manuscripts of the Gospels of the period ranging from the 7th to the 10th century. The third variety consisting of high crosses with pure Celtic ornamentation may range from the 10th to the 12th century. This form of monument — a high cross — with local variations and a remarkable development of foliageous ornamentation common to the recumbent sepulchral slabs of the same district, continued in the West Highlands from the 13th to the 16th century.

Scuncheon, in architecture, the stones or arches thrown across the angles of a square tower to support the alternate sides of the octagonal spire; also the cross-pieces of timber across the angles to give strength and firmness to a frame.

Scuppers, channels cut through the sides of a ship at the edges of the deck to carry water off the deck into the sea.

Scurvy, or **Scorbutus,** a disease characterized by a depraved condition of the blood. In consequence of this morbid state of the blood there is great debility of the system at large, with a tendency to congestion, hemorrhage, etc., in various parts of the body, and especially in the gums. It has probably existed from the earliest times, but the first distinct account of it is contained in the history of the crusade of Louis IX. in the 13th century against the Saracens of Egypt, during which the French army suffered greatly from it. In the 16th century it prevailed endemically in various parts of the N. of Europe, and it seems only to have abated toward the close of the 18th century. It was in badly fed armies, in besieged cities, and on board ship, that its ravages were most appalling; and it is believed that more seamen perished from scurvy alone than from all other causes combined, whether sickness, tempest, or battle. For instance, only 1,512 sailors and marines were killed in all the naval battles of the Seven Years' War; but 133,708 died of disease or were missing, and scurvy was the principal disease. Whole crews were prostrated by this scourge, as in the well-known case of Lord Anson's memorable voyage. It is still met with among seamen, though cases are comparatively rare, and also among the lower classes in large towns, navvies engaged in railway work, etc., when they confine their diet to tea, bread, ham, salt-fish, etc., to the exclusion of fresh vegetables and meat.

The first effect of the disease is generally a decline in the general health, and the patient becomes depressed, is easily fatigued, and has a peculiar sallow complexion. After a variable period, the more characteristic symptoms appear, the chief of which are hemorrhages and sponginess of the gums. The hemorrhages closely resemble those of purpura and occur into and under the skin, where they give rise to red or purple discolorations which change color

like the marks of bruises; into the muscles and other deeper tissues, where they cause brawny swellings; and into internal organs or cavities. Hemorrhage also frequently takes place from the mucous membranes of the nose and alimentary canal. The affection of the gums is still more characteristic, and is rarely absent, except in the very young or very old, who are without teeth. The gums are swollen, discolored, detached from the teeth, and bleed very easily, while the breath becomes very fetid. This combination sometimes precedes but often follows the occurrence of hemorrhage in other situations.

The cause of scurvy is now well known to be an improper diet. The disease is never known to have occurred in any one who had eaten freely and habitually of fresh vegetable food. Even preserved vegetables, if kept in a juicy condition, prevent the occurrence of the disease. Fresh meat and, in a less degree, milk are antiscorbutic. An efficient protective is lemon or lime juice; and the constant use of the latter during long voyages undoubtedly prevents the occurrence of scurvy when it would otherwise be inevitable. Scurvy is more apt to affect those who are deprived of fresh air and sunlight, are mentally depressed, and have had their health enfeebled by previous disease. In what way the deprivation of fresh vegetables acts on the blood to produce scurvy is as yet unknown. Dr. Garrod's theory, that the element wanting is a sufficient supply of potash salts, is not generally accepted; for it has never been proved that potash salts by themselves are sufficient to prevent this disease.

Though the virtues of lemon juice in scurvy were known in England as far back as 1636, this invaluable medicine was not made an essential element of nautical diet till 1795. The effect of this official act may be estimated from the following figures. In 1780 the number of cases of scurvy received into Haslar Hospital (a purely naval hospital) was 1,457, while in 1806, as also in 1807, there was only one case. The potato possesses almost equally great antiscorbutic properties. Dr. Baly (1814–1861), to whom we are indebted for this discovery, states that "in several prisons the occurrence of scurvy wholly ceased on the addition of a few pounds of potatoes being made to the weekly diet." For the cure, as for the prevention of the disease, the diet is by far the most important agent; lime, lemon, or orange juice should be given freely. Sometimes the condition of the mouth prevents the administration of vegetables; but when possible they should be given freely. Washes of chlorate of potash, tannin, or Condy's fluid should be used for the gums; if they are severely affected solid nitrate of silver may be applied to them with advantage.

Scurvy Grass, *Cochlearia officinalis,* a cruciferous plant, growing in Great Britain and elsewhere on the seashore and on the mountains. It has long been esteemed for its antiscorbutic property, and hence its name. The leaves are slightly pungent, and are sometimes used as a salad.

Scutage, or **Escuage,** in feudal law, the service by which a vassal was bound to follow his lord to war at his own charges. It was afterward commuted for a pecuniary satisfaction and became a parliamentary assessment, the custom of commuting service having become general and the rate of commutation variable.

Scutari (skö'tä-rē), a town of Asiatic Turkey, situated opposite Constantinople, on the banks of the Bosporus, in Asia Minor. Its site is beautiful, and fine views of Constantinople and the surrounding scenery are obtained from the hills above. It has a palace and gardens belonging to the Sultan, a college of dervishes, a college for girls (conducted by Americans), barracks, public baths, and extensive cemeteries, used by the Turks of Constantinople, from their belief that the soil of Asia is more sacred than that of Europe. There is also a densely-filled English burial ground containing Marochetti's monument in honor of 8,000 nameless British soldiers of the Crimean War (1854–1856). Scutari was the scene of Florence Nightingale's labors during this war. It carries on a considerable trade, being a rendezvous for the caravans which come from the interior of Asia. Pop. variously estimated from 30,000 to 75,000.

Scutching Machine, a machine for rough-dressing fiber, as flax, cotton, or silk.

Scutellaria, in botany, skull-cap; the typical genus of *Scutellareæ.* Calyx broadly ovate, with a tooth or scale on the inner side, the two lips closed after flowering; corolla, with the tube much exserted, upper lip straight, arched, lower one trifid; anthers of the two lower stamens one-celled, those of the two upper ones two-celled. Known species about 90 from the temperate and sub-tropical parts of both hemispheres.

Scylla (sil'la), in classical mythology, a daughter of Nisus, King of Megara. When Minos came from Crete to take vengeance for the death of his son, Androgeos, his efforts to take the city were fruitless as long as the purple lock on the head of Nisus remained unshorn. Urged by her love for Minos, Scylla cut off the fatal lock, and with it destroyed the life of her father and the safety of the city. According to one version Minos tied Scylla to the stern of his ship and drowned her; but another tale says that she was changed into a fish, which Nisus transformed into an eagle, constantly pursued. The myth was localized in the names of the port of Nisæa and the promon-

tory Scyllæum. The "Odyssey" (xii: 73) speaks of another Scylla, a daughter of Cratæis, as a monster with 12 feet, six necks, and six mouths, each containing three rows of teeth. This being haunted a rock on the Italian coast; a neighboring rock being tenanted by Charybdis, who thrice every day swallowed the waters of the sea, and thrice threw them up again. Like Medusa, Scylla is represented in some legends as having been beautiful, and as having been changed into a monster through the jealousy of Circe or Amphitrite.

Scylla and **Charybdis** (kar-ib'dis), the former a famous promontory and town of Southern Italy, at the entrance to the narrow strait separating Italy from Sicily. The promontory is 200 feet high, projecting into the sea, and at its base is the town. The navigation at this place was looked upon by the ancients as attended with immense danger, which, however, seems to have been much exaggerated, for at the present day the risk is not more than attends the doubling of an ordinary cape. Charybdis (modern name Galofaro) is a celebrated whirlpool in the Straits of Messina, nearly opposite the entrance to the harbor of Messina in Sicily, and in ancient writings always mentioned in conjunction with Scylla. The navigation of this whirlpool is, even at the present day, considered to be very dangerous, and must have been exceedingly so to the open ships of the ancients. A modern writer describes it as being "an agitated water of from 70 to 90 fathoms in depth, circling in quick eddies." Homer places it immediately opposite to Scylla, probably taking advantage of poetic license to exaggerate the danger of the navigation.

Scylliidæ, in ichthyology, a family of *Selachoidei*, with several genera, widely distributed. Two dorsals without spine, the first above or behind the ventrals, anal present; no nictitating membrane; spiracle always distinct; mouth inferior, teeth small, usually in several rows.

Scymnidæ, a family of sharks, distinguished by the absence of an anal fin, and by dorsals unfurnished with spines. The lobes of the caudal fin or tail are nearly equal, and the head is furnished with a pair of small spiracles. The Greenland shark is the best-known species.

Scythe, an implement which has been known from the earliest ages. The ancient form being nearly the same as the modern. It consists of a curved steel blade fixed at right angles to a long, crooked handle, to which are fastened two other smaller handles. One of the first American inventions was an improvement in the scythe, originated by Joseph Jenks, who strengthened the back edge of the blade by welding to it a strip of iron. Scythes are used for cutting grass and wheat; when for the latter purpose, a piece of wickerwork, called a cradle, is attached. In antiquity, the curved, cutting blade, which was affixed to the wheels of war chariots, was called a scythe. The implement in its agricultural form was an emblem of Saturn or Chronos or old "Father Time."

Scythians, a name very vaguely used by ancient writers. It was sometimes applied to all the nomadic tribes which wandered over the regions to the N. of the Black and the Caspian Seas, and to the E. of the latter. In the time of the Roman empire the name Scythia extended over Asia from the Volga to the frontiers of India. The people of this region, being little known, were the subject of numerous fables.

Scyphus, a kind of large drinking cup, anciently used by the lower orders among the Greeks and Etrurians. In botany, Haller's name for a corona when it constitutes an undivided cup. Example, the narcissus.

Scythrops, in ornithology, the channel bill; a genus of *Cuculidæ,* or in classifications in which that family is divided, of *Crotophaginæ;* bill long and strong, hooked at tip, sides channeled; two front toes united at base; one species, ranging from East Australia to Molucca and Celebes.

Sea, a general name for the great body of salt water which covers the greater part of the earth's surface; the ocean. In a more limited sense the term is applied to a part of the ocean which from its position or configuration is looked upon as distinct and deserving of a special name, as the Mediterranean Sea, the Black Sea, etc. The term is also occasionally applied to inland lakes, as the Caspian Sea, the Sea of Galilee, etc. All primitive peoples appear to have experienced a feeling of dismay when they have braved the dangers of the sea. The great majority of the civilized nations of antiquity took but little interest in the physical phenomena of the ocean. The few facts that were known with reference to the sea were limited to maritime nations like the Phœnicians. Among the learned men of antiquity two views were held with reference to the distribution of land and water. The Homeric school — to which Eratosthenes and Strabo belonged — regarded the Old World as a single island surrounded by the ocean. The Ptolemaic school, on the other hand, looked on the Atlantic and Indian Oceans as enclosed seas like the Mediterranean, and held that the E. and W. points of the known world approached so close to each other that a ship sailing from Spain might easily reach the E. coasts of Asia. This mistaken notion led, 14 centuries after Ptolemy, to the discovery of America by Columbus. The discoveries of Columbus, Vasco da Gama, and Magellan, during the

Sea

30 years from 1492 to 1522, added a hemisphere to the chart of the world. These voyages doubled at a single bound all that was previously known of the surface of the globe, and in a special manner enlarged our knowledge of the sea. Down to the time of the "Challenger" and similar recent scientific expeditions all our knowledge of the sea might, literally speaking, be called superficial; it was limited to the upper layers of oceanic waters and to the shallower depths surrounding continents and islands. Owing to the recent introduction of improved apparatus and methods, the most profound depths of the ocean have been examined with precision and success, so that we now possess a large amount of definite information concerning the physical and biological conditions of all regions of the ocean.

Area.— The waters of the sea cover about 143,259,300 square miles, or about five-sevenths of the surface of the earth. The areas of the main division of the ocean are estimated as follows:

	Sq. miles.	Per ct.
Pacific (from Arctic Circle to 40° S.)	58,100,000	40.54
Atlantic (from Arctic Circle to 40° S.)	30,150,000	21.04
Indian (S. boundary 40° S.)	18,100,000	12.63
Southern (from 40° S. to Antarctic Circle)	27,300,000	19.05
Arctic (within the Arctic Circle)	5,000,000	3.49
Antarctic (within the Antarctic Circle)	4,650,000	3.25
	143,300,000	100.00

Depth.— The solid globe or lithosphere, viewed as to its superficial aspect, may be regarded as divided into two great planes; one of these corresponds to the dry land or upper surface of the continental masses, and occupies about two-sevenths of the earth's surface; the other, corresponding to the abysmal regions of the ocean, is depressed over 2½ miles below the general level of the continental plane, and occupies about four-sevenths of the earth's surface. The transitional area, uniting these two planes, forms the sides or walls of the ocean basins, and occupies about one-seventh of the earth's surface. The depressed regions of the globe, represented by the ocean basins, are filled with sea water up to within about 375 fathoms (2,250 feet) of the general level of the continents, the average depth of the water in the ocean basins being on the other hand about 2,080 fathoms (12,480 feet). Were the solid crust of the earth to be reduced to one uniform level by removing the elevated continental masses into the depressed abysmal areas, the surface of the earth would then be covered by a universal ocean or hydrosphere with a depth of about 2 miles. This depth of 2 miles below the present sea-level has been called by Dr. Mill the mean sphere level.

The average depths of the main divisions of the ocean are:

Pacific Ocean	2,500 fathoms.
Atlantic Ocean	2,200 "
Indian Ocean	2,300 "
Southern Ocean	2,200 "
Antarctic Ocean	630 "
Arctic Ocean	630 "

The greatest depth hitherto recorded is 4,655 fathoms in the North Pacific E. of Japan; the "Challenger" sounded in 4,475 fathoms, also in the North Pacific N. W. of the Caroline Islands. In the South Pacific a depth of 4,428 fathoms has been found S. of the Friendly Islands, and 4,170 fathoms off the W. coast of Chile. A sounding of 5,269 fathoms was made by officers of the United States naval vessel "Nero" in 1899, at a point about 70 miles S. E. of Guam Island, near where the "Challenger" took its greatest sounding (4,475 fathoms). In the Atlantic the greatest depth is 4,561 fathoms, off Porto Rico. Ross records a sounding in the Antarctic Ocean where he found no bottom at 4,000 fathoms. By far the larger portion of the sea floor lies between the depths of 1,000 and 3,000 fathoms, equal to nearly 78 per cent., while about 17½ per cent. is found in depths less than 1,000 fathoms, and about 4½ per cent. in depths greater than 3,000 fathoms. The bulk of water in the whole ocean is estimated at 323,800,000 cubic miles.

Temperature.— The temperature of the surface waters of the ocean varies from 28° F. in the polar regions to 85° or 86° in equatorial regions. In many places the surface layers are subject to great annual changes due to the seasons and the direction of the wind. The temperature of the water at the bottom of the ocean over the abysmal areas ranges from 32.7° F. to 36.8° F. In some large basins separated from each other by low ridges the temperature may differ to the extent of one or two degrees, but the temperature is apparently constant at any one spot throughout the year. The great mass of the ocean consists of cold water — *i. e.*, of water below 40° or 45° F.; at a depth of little over half a mile the water in the tropics has generally a temperature below 40° F. In the open ocean the temperature usually decreases as the depth increases, the coldest water being found at the bottom. In enclosed or partially enclosed seas, cut off by barriers from the great ocean basins, the temperature remains uniform from the height of the barrier down to the bottom; for instance, in the Mediterranean the temperature is about 56° from 200 fathoms down to 2,000 fathoms; in the Sulu Sea, 50.5° from 400 fathoms to 2,500 fathoms; in the Celebes Sea, 38.6° from 800 fathoms to the bottom in 2,600 fathoms. In regions where there are heavy rains, or where rivers pour fresh water into the sea, alternating layers of

colder and warmer water have been observed within a hundred fathoms from the surface.

Circulation.— The circulation of oceanic waters is maintained by the action of the prevailing winds on the surface layers. In the oceanic areas the prevailing winds are governed by the large anticyclonic areas situated toward the centers of the North and South Atlantic and North and South Pacific. The winds blow out from and around these anticyclonic areas. For instance, in the Southern Hemisphere the warm salt water of the tropical regions is driven to the S. along the E. coasts of South America, Africa, and Australia, till on reaching a latitude of between 50° and 55° S. it sinks on being cooled and spreads slowly over the floor of the ocean to the N. and S. A similar circulation takes place in the Northern Hemisphere, though much modified by the peculiar configuration of the land masses; for instance, the cold salt water at 30° F. which occupies the deeper parts of the Arctic basin is largely made up of the dense Gulf Stream water, which sinks to the bottom on being cooled in the Norwegian Sea. The water evaporated from the sea surface is borne to the land masses and condensed on the mountain slopes. It is estimated that over 6,500 cubic miles of this water is returned to the sea by rivers annually, bearing along with it a burden of soluble salts and earthy matters in suspension; in this way the ocean has in all probability become salt in the course of ages. The saltest waters are found in the regions of greatest evaporation; for instance, in the Red Sea, Mediterranean, and in the trade-wind regions of the great ocean basins. It has been shown that by the action of off-shore winds cold water is brought up from the deep sea to supply the place of the surface water carried seaward off the W. coast of Africa and America, and off Cape Gouardafui on the E. coast of Africa; and the absence of coral reefs off these coasts is believed to be due to the great range and variation in the temperature of the water thus produced.

Composition of Sea Water.—It is probable that every element is in solution in sea water; the great majority, however, present only in exceedingly minute traces. If the average density of sea water be taken at 1,027, pure water being 1,000, then the following would represent the composition of 1,000 cubic centimeters of sea water:

Sodium chloride	28.9980
Magnesium chloride	4.0568
Magnesium sulphate	1.7665
Calcium sulphate	1.3425
Potassium sulphate	0.9193
Magnesium bromide	0.8809
Calcium carbonate	0.1287
Water	989.7073
	1027.0000

Each base is probably in combination with each acid, so that there are really 16 salts altogether from the mixture of the four bases and four acids. The total amount of sea salts may vary greatly in different samples of sea water, but it has been shown by hundreds of carefully conducted experiments that the ratio of the constituents of sea salts is nearly everywhere constant, with one significant exception, that of lime, which is in slightly greater proportion in the water from the deeper parts of the ocean basins. Owing to the constant circulation in the ocean, the gases of the atmosphere, which are everywhere absorbed at the surface of the sea, are carried down to the greatest depths, and thus living organisms may flourish throughout the whole extent of the ocean. Nitrogen remains at all times and places nearly constant; not infrequently the proportion of oxygen is much reduced in deep water, owing to the processes of oxidation and respiration. Carbonic acid free or loosely combined is abundant, and plays a most important rôle in the economy of the ocean, combining with and rendering soluble normal carbonates of lime and magnesia to solution in the form of bicarbonates. Water, as is well known, is but slightly compressible, and almost any substance that will fall to the bottom of a tumbler of water will in time fall to the bottom of the deep ocean. Still the compressibility of water must not be neglected in oceanographical questions. In the deeper parts of the ocean the pressure amounts to four or five tons per square inch; hence, in an ocean with a depth of 5 miles, were the action of gravity suddenly to cease, the ocean waters would rise 500 feet above their present level from expansion. There is evidence of very extensive chemical action on some regions of the sea floor, and it has been suggested that this action is much intensified by the great pressure in the deeper parts of the ocean. It is probable, however, that all the reactions here alluded to may be accounted for by the decomposition of organic substances on the sea bed in the presence of the sulphates in sea water, and the long periods of time to which the materials on the sea bed have been exposed to the action of sea water in regions where there is a slow rate of deposition.

Life.— The color of pure sea water is a light shade of blue; it has, however, frequently various shades of green and brown, owing to the presence of organisms and matters in suspension. It has been definitely established that life in some of its many forms is universally distributed throughout the ocean. It has long been known that marine plants and animals abound in the shallow waters surrounding continents and islands. Algæ disappear from the sea bed at depths between 100 and 200 fathoms, but

Sea

a great abundance of animals have been procured in the greater depths. A "Challenger" trawling in a depth of over a mile (1,000 fathoms) yielded 200 specimens of living animals belonging to 79 species and 55 genera. A haul in about two miles (1,600 fathoms) yielded 200 specimens belonging to 84 species and 75 genera. A trawling in about three miles depth (2,600 fathoms) yielded 50 specimens belonging to 27 species and 25 genera, not counting Protozoa. Even in depths of over four miles fishes and animals belonging to all the chief invertebrate groups have been procured. The term "Benthos" is now used for all the animals and plants which live attached to or creep over the bottom of the ocean, "Plankton" being the term for all the plants and animals which live in, and are carried along by the currents of, the ocean. In the great body of oceanic waters life is most abundant in the surface and subsurface waters down to about 100 fathoms. Pelagic algæ, such as diatoms and oscillatoria, are abundant in this region, and are the principal and original source of food for many pelagic and nearly all deep-sea animals. In the intermediate depths of the ocean life though present is less abundant. Within a few hundred fathoms of the bottom life again becomes more abundant, crustaceans and cuttle fish being especially numerous. A very large number of the organisms which belong to the pelagic Plankton, such as diatoms, radiolaria, foraminifera, and mollusks, secrete silica or carbonate of lime to form their shells and skeletons; these in falling to the bottom after the death of the organisms make up a large part of the marine deposits in many regions of the ocean.

Deposits.— The explorations of the "Challenger" and other expeditions have resulted in a great extension of our knowledge of marine sediments, especially of those now forming in the deep sea. All marine deposits may be divided into two classes — viz., those made up principally of the debris from the solid land of the globe, laid down in greater or less proximity to the shores of continents and islands, called "terrigenous" deposits, and those in which this continental debris is nearly or quite absent, laid down in the abysmal regions of the ocean, called "pelagic" deposits. Commencing with the former, there are first the littoral and shallow-water deposits, forming around the land masses from the shore down to a depth of about 100 fathoms, consisting of sands, gravels, and muds derived almost entirely from the disintegration of the neighboring lands. The littoral deposits, laid down between tide marks, cover about 63,000 square miles, and the shallow-water deposits, between low-water mark and 100 fathoms, about 10,000,000 square miles. Proceeding seawards from an average depth of about 100 fathoms, the deposits gradually change in character, the proportion of land detritus decreasing, while the remains of oceanic organisms increase in abundance till at a considerable distance from land and in comparatively deep water the terrigenous deposits pass insensibly into truly pelagic deposits. The terrigenous deep-sea deposits — *i. e.*, those formed at depths greater than 100 fathoms — may be briefly summarized as follows:

Blue mud, the most extensive, is grayish or bluish in color, with usually a thin reddish upper layer, and is characterized by the presence of fragments of rocks and mineral particles coming from the disintegration of the land, of which quartz is the principal species; the remains of marine organisms may be present in varying proportions, increasing with depth and distance from the land. Blue mud is found along the coasts of continents and continental islands, and in all enclosed and partially enclosed seas; in some places, as in the Yellow Sea, but notably off the coast of Brazil, the mud may be of a red color from the large amount of ferruginous matters brought down by the rivers, and it is then called red mud. Blue mud is estimated to cover about 14,500,000 square miles of the earth's surface — 4,000,000 in the Arctic, 3,000,000 in the Pacific, 2,500,000 in the Antarctic, 2,000,000 in the Atlantic, 1,500,000 in the Indian, and 1,500,000 in the Southern Ocean. Red mud covers about 100,000 square miles off the coast of Brazil.

Green mud and sand are similar to the blue muds, but are characterized by the presence of the mineral glauconite in isolated grains or in small concretions; the dead shells of calcareous organisms are usually filled with the glauconite, which gives the green color to the deposits. The sands occur in the shallower water nearer the coast, and in them the grains are larger than in the muds. These deposits are found usually off high and bold coasts where no very large rivers enter the sea; for instance, off the E. coast of Australia, off South Africa, and off the W. coast of North America. Green mud and sand cover about 850,000 square miles — 300,000 in the Atlantic, 250,000 in the Pacific, 150,000 in the Indian, 90,000 in the Southern, and 60,000 in the Antarctic.

Volcanic mud and sand are deposited around the oceanic islands of volcanic origin and the name is derived from the presence of fragments and particles of volcanic rocks and minerals, which are larger and more numerous nearer the islands, when the deposit is called a sand, becoming smaller and mixed with a larger percentage of pelagic organic remains in the deeper water farther removed from the coast, when the deposit is called a mud. Volcanic mud and

sand cover about 600,000 square miles — 300,000 in the Pacific, 200,000 in the Atlantic, and 100,000 in the Indian Ocean.

Coral mud and sand occur similarly around the oceanic coral islands and off those coasts and islands fringed by coral reefs, and are characterized by the greater or less abundance of coral fragments from the reefs. The sands are found in the shallower water nearer the reefs, as in the case of the volcanic sands. Coral mud and sand cover about 2,557,000 square miles — 1,417,000 in the Pacific, 760,000 in the Atlantic, and 380,000 in the Indian Ocean.

Of pelagic deposits there are five types, four of organic origin, receiving their designations from the distinctive presence of the remains of calcareous or siliceous organisms, the fifth and most extensive being of inorganic origin.

Globigerina ooze is so called from the presence of the dead shells of pelagic *Foraminifera*, those belonging to the genus *Globigerina* predominating, which live in the surface and sub-surface waters of the ocean, being especially abundant in tropical regions, and the shells of which after death fall to the bottom and there accumulate in moderate depths. The percentage of carbonate of lime in the deposit due to these shells and other calcareous fragments varies from 30 to over 90, and there is usually an admixture of minute mineral particles and remains of siliceous organisms. The depth at which *Globigerina* ooze is found varies from less than 500 to over 2,500 fathoms, the average depth being about 2,000 fathoms; but there is a marked difference between a sample collected in comparatively shallow water near land and one from deep water toward the central regions of the ocean basins, the point of union being the presence of a considerable proportion of carbonate of lime shells. Globigerina ooze covers about 49,520,000 square miles — 17,940,000 in the Atlantic, 11,300,000 in the Pacific, 10,560,000 in the Southern, and 9,720,000 in the Indian Ocean.

One of the facts brought out by recent oceanographical researches is the gradual disappearance of these calcareous shells from the deposits of the deep sea with increasing depth in regions where they may appear to be equally abundant at the surface. In depths of over 3,000 fathoms these shells are rare, and often there is not a trace of carbonate of lime even in lesser depths, the Globigerina ooze being then replaced by one of the other kinds of pelagic deposits.

Pteropod ooze resembles Globigerina ooze in all respects, except that there is a greater abundance of the dead shells of pelagic mollusca, such as pteropods and heteropods: it is usually found in lesser depths than the Globigerina ooze. Pteropod ooze covers about 400,000 square miles in the Atlantic.

The names applied to these oozes are not intended to convey the idea that they are wholly made up of the organisms indicated by the names, or that these organisms form a preponderating proportion, for no deep-sea deposit can be said to be strictly homogeneous. Neither is there a sharp dividing line between the various kinds of deposits; they merge insensibly the one into the other. Often it is difficult to locate a sample, one or other of the names being equally applicable.

Diatom ooze is distinguished by the presence of numerous remains of siliceous organisms, principally Diatoms, though fragments of siliceous sponge spicules and *Radiolaria* and *Foraminifera* are rarely absent. It is found in the Antarctic and Southern Oceans and also in the Northwest Pacific. Diatom ooze covers about 10,880,000 square miles — 10,000,000 in the Southern, 840,000 in the Antarctic, and 40,000 in the Pacific.

Radiolarian ooze in like manner contains a varying proportion of siliceous remains, in this case principally *Radiolaria* and their fragments. Calcareous organisms and mineral particles are nearly always present in both these oozes, being usually more numerous and the mineral particles larger in the diatom ooze than in the radiolarian ooze, which latter generally occurs in greater depths than the former. The "Challenger's" deepest sounding, already mentioned, brought up a typical radiolarian ooze, and it is found in the deeper water of the Central Pacific and Indian Oceans. Radiolarian ooze covers about 2,290,000 square miles — 1,161,000 in the Pacific, and 1,129,000 in the Indian Ocean.

Red clay occupies nearly the whole of the deeper abysses of the ocean, occurring in its most characteristic form in the central regions of the Pacific, far removed from continental land. It is of a reddish or chocolate color, due to the presence of the oxides of manganese and iron. Fragments of calcareous organisms are sometimes tolerably abundant in the shallower depths, but in a typical red clay there is usually not more than a trace of carbonate of lime. Siliceous remains are generally present, and there is a small proportion of minute mineral particles of volcanic origin, principally derived from disintegrated pumice. Mineral particles of secondary origin, arising from the decomposition of volcanic debris, are associated with the red clay, and in some regions of the Central Pacific isolated crystals and spheroidal groups of phillipsite of secondary origin formed *in situ* make up a considerable quantity of the deposit. Concretions of manganese and iron are very characteristic of the red clays, and may be of all sizes, sometimes a large quantity of the size

of marbles, and sometimes the size of potatoes, being procured. These concretions are formed around various nuclei, such as sharks' teeth, carbones of whales, and pieces of pumice. The "Challenger" sometimes procured over 1,000 sharks' teeth and 60 carbones of whales in a single haul. The presence of the remains of vertebrates, some of them belonging to extinct species lying alongside others belonging to existing species, as well as the formation of manganese nodules and zeolitic crystals *in situ*, and the presence of metallic and chondritic spherules of cosmic origin, appear to indicate that the red clay accumulates at a very slow rate. Red clay covers about 51,500,000 square miles — 37,230,000 in the Pacific, 5,800,000 in the Atlantic, 4,350,000 in the Southern, and 4,120,000 in the Indian Ocean. See DEEP-SEA EXPLORATION.

Sea Anemone, the popular name given to a number of animals of the sub-kingdom Cœlenterata and class Actinozoa, including the genus *Actinia* and other genera. They are among the most interesting organisms met with on the sea beach, and in aquaria form a great attraction. All sea anemones, however varied in coloration or form, present the essential structure and appearance of a fleshy cylinder, attached by its base to a rock or stone, and presenting at its free extremity the mouth, surrounded by a circlet of arms or tentacles. With these tentacles, which may be very numerous, in some cases exceeding 200 in number, they seize and secure their food — small crustacea, mollusks, such as whelks, etc. — which they paralyze by means of the thread cells common to them with all Cœlenterata. The mouth leads into a stomach sac, which, however, is imperfectly specialized, and is such that a generalized idea of the structure of a sea anemone may be gained by supposing that the animal in transverse section represents a double tube, the outer tube corresponding to the body walls, and the inner tube to the stomach sac. When fully expanded, the appearance of the anemones in all their varieties of color is exceedingly beautiful. But on the slightest touch the tentacles can be quickly retracted within the mouth aperture, the fluids of the body are expelled by the mouth, and the animal, from presenting the appearance of a fully expanded flower, becomes a conical mass of jelly-like matter. Though these forms are attached to rocks and fixed objects, they appear able to detach themselves at will. They are, most of them, diœcious, that is, having the sexes situated in different individuals. The young are developed within the parent body, and appear in their embryo state as free swimming ciliated bodies of an oval shape. The sea anemones resemble the *Hydræ* in their marvelous powers of resisting injuries and mutilation. Thus if a sea anemone be divided longitudinally, a new animal will in due time be formed out of each half. They appear singularly insusceptible also to the action of hot or cold water, and seem to be wonderfully long-lived. A well-known instance of longevity on the part of the sea anemone is that afforded by one named "Granny," which was taken by Sir John Dalyell in 1828, and lived till 1887. They are eaten as food in Italy, Greece, Provence, and on various other coasts.

Sea Ape, a name sometimes given to the fox shark or thresher.

Sea Bathing, an exercise that produces the stimulating effects of the ordinary cold bath with the additional stimulus due to the salt, so that it acts as an invigorating tonic. Persons who are anæmic — that is of deficient quality of blood — and those suffering from any internal complaint ought to refrain from sea bathing. It has, however, been found very salutary in several complaints, as diseases of the glands of all kinds, and of the skin in scrofula and a scrofulous predisposition, exhausting sweats, and tendency to catarrhs, chronic nervous diseases, particularly hysteric attacks, epilepsy, St. Vitus's dance; also sometimes in chronic rheumatism.

Sea Bear, a name sometimes given to the polar bear; also to a kind of seal.

Sea Buckthorn, or **Sallow Thorn** (*Hippophaë*), a genus of the natural order *Elæagnaceæ*, consisting of large shrubs or trees with gray silky foliage and entire leaves. They have diœcious flowers; the perianth is tubular, becomes succulent, encloses an achenium, and forms an acid fruit. There is but one known species, *H. rhamnoides*, sometimes called the sea buckthorn, a large thorny shrub or low tree, a native of parts of the sandy sea coasts of England and the continent of Europe, which is found also throughout a great part of Tartary. It is sometimes planted to form hedges near the sea, growing luxuriantly where few shrubs will succeed. The berries are orange colored and are gratefully acid. They are used in some places for making fish sauce, jellies, and condiments.

Seabury, Samuel, an American clergyman; born in Groton, Conn., Nov. 30, 1729; was graduated at Yale in 1748; studied medicine at Edinburgh; and received deacon's and priest's orders in England in 1753. For some time he was a missionary of the S. P. G.; in 1757 he was promoted to the "living" of Jamaica, Long Island, and 10 years later to that of Westchester, N. Y. The Whigs, however, prevented his ministering, and once imprisoned him for six weeks at New Haven. He removed to New York, where he made his medical knowledge contribute to his support, acted as chaplain

of the King's American Regiment, and wrote a series of pamphlets which earned for him the special hostility of the patriots. On March 25, 1783, the clergy of Connecticut met at Woodbury and elected Seabury bishop; and for 16 months he waited vainly in London for consecration, the archbishops, though personally favorable, being timid and indisposed to move without the sanction of the civil authority. On Nov. 14, 1784, he was consecrated at Aberdeen by Bishops Robert Kilgour, Arthur Petrie, and John Skinner, of the Scotch Episcopal Church, whose connection with the State had been severed nearly a century before. Bishop Seabury's jurisdiction embraced Rhode Island as well as Connecticut, and he acted also as rector of St. James's Church, New London. In 1792 he joined with three bishops of the English succession in consecrating a fifth, Bishop Claggett, through whom every American bishop derives from Seabury and the Scotch Church. Seabury's further services included the securing to the episcopate of its proper share in the government of the Church, and the restoration of the oblation and invocation to the Communion Office (from the Scotch Office). He died Feb. 26, 1796.

Sea Dragon, in ichthyology, *Pegasus draconis*, common in the Indian Ocean. The popular name has reference to the resemblance of this fish to the mythical dragon.

Sea Eagle, a name applied to one or two members of the eagle family; but probably with most distinctive value to the cinereous or white-tailed eagle or erne, *Haliaëtus albicilla*, found in all parts of Europe. It is generally found inhabiting the seacoasts, and though living mainly on fish, yet makes inland journeys in search of food, and seizes lambs, hares, and other animals. The head is covered with long drooping feathers of ashy brown color, while the body is of a dark-brown hue, streaked in some places with lighter tints, and having the primary feathers of the wing mostly black. The tail is rounded, and is of white color in the adult, but brown in the young bird. The bird breeds in Shetland and in the Hebrides. Its average size appears to be about three feet in length, and from six to seven feet in expanse of wings. The American baldheaded eagle, *Haliaëtus leucocephalus*, from its frequenting the seacoasts is also named the sea eagle. See EAGLE.

Sea Elephant, a large seal, called also bottle-nosed seal and seal elephant. It is the largest of the seal family, being larger than an elephant. The average length of the male is 12 to 14 feet, but some of 20 and 25 feet are mentioned. The female is generally about 10 feet long. It gets its name from its size and from its proboscis, which stretches out a foot or more, somewhat like the trunk of an elephant. The males are slaty-blue or brown, the female olive-brown above and yellowish below. Their hair is coarse and useless, but their thick skin makes good harness leather. The blubber yields a fine clear oil as good as sperm oil, without bad smell or taste. In England it is used for softening wool and in making cloth. The sea elephant was once found in abundance at Heard's Island in the Southern Indian Ocean, and at the Falkland and South Shetland Islands and other islands in the South Atlantic, and thousands of barrels of oil were brought from there every year, but the elephants were hunted so persistently that few are now left. It was once common, too, on the coast of California, but is now seldom seen.

Seaforthia, a genus of *Areccæ*, having elegant palms, with pinnate fronds, polygamous or monœcious flowers, sessile on a branched spadix, with several incomplete spathes; calyx and corolla trifid; males with many stamens and the rudiments of a pistil; style very short; stigmas three; berry small, oval, one-seeded. Some have dwarf, reed-like stems, others rise 30 or 40 feet high. Known species about 25, from the Indian Archipelago and Australia. Type, *S. elegans*, from the latter region.

Sea-girt Isle, a poetical name given to England.

Sea Grape, a genus of plants, the *Ephedra*, natural order *Gnetaccæ*, closely allied to the conifers. The species consist of shrubs with jointed stems, whence they are also called joint firs.

Sea Hare, *Aplysia*, the name of a genus of gasteropodous mollusca. These animals are slug-like in appearance, and derive their popular name from the prominent character of the front pair of tentacles, which somewhat resemble the ears of a hare. The shell is either absent or is of very rudimentary character, and is concealed by the mantle. Four tentacles exist, and the eyes are situated at the base of the hinder tentacles. The sea hares are widely distributed throughout most seas, and generally inhabit muddy or sandy tracts. They emit a fluid of a rich purple hue, which, like the ink of the cuttle fishes, has the property of diffusing itself quickly throughout the surrounding water. They are also known to discharge an acrid fluid of milky appearance, which has an irritant effect on the human skin, and in the case of *A. depilans* was thought to have the property of removing hair. *A. hybrida* is the common British species.

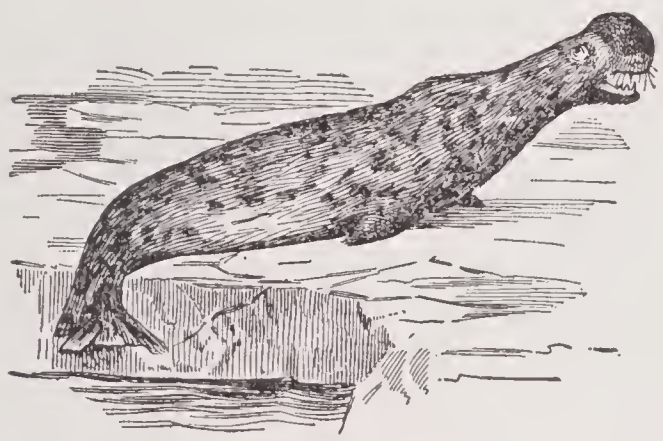
Sea Horse, a popular name for the hippopotamus and the walrus. Also a fabulous animal, represented with foreparts like those of a horse, and with hinder parts like a fish. Neptune employed them to draw

his chariot. In the sea horse of heraldry, a scalloped fin runs down the back.

Sea Kale, *Crambe maritima,* a perennial cruciferous herb, a species of colewort, called also sea cabbage. It is a native of the sea-coasts of Europe, and is much cultivated in gardens as a table vegetable, the blanched young shoots and leaf-stalks being the parts eaten.

Seal, an impression made on paper, clay, wax, or other substance, by means of a die of metal, stone, or other hard material. The stamp which yields the impression is frequently itself called the seal. The use of seals may be traced to the remotest antiquity. The Bible contains frequent allusions to them, and their use has been common in all the European states from the earlist historical periods. In modern times the seal has lost the power of acting as a substitute for signatures, and is now only affixed to legal instruments so as to furnish evidence of their authenticity.

Seal, in zoölogy, the family *Phocidæ,* or seal tribe, are, of all four-limbed mammiferous animals, those which display the most



HOODED SEAL.

complete adaptation to residence in the water. The seal has considerable resemblance to a quadruped in some respects, and to a fish in others. The head is round, and the nose, which is broad, resembles that of a dog, with the same look of intelligence and mild and expressive physiognomy. It has large whiskers, oblong nostrils, and great black sparkling eyes. It has no external ears, but a valve exists in the orifices, which can be closed at will, so as to keep out the water; the nostrils have a similar valve; and the clothing of the body consists of stiff glossy hairs, very closely set against the skin. The body is elongated and conical, gradually tapering from the shoulders to the tail. The spine is provided with strong muscles, which bend it with considerable force; and this movement is of great assistance to the propulsion of the body. Though in most of the foregoing particulars the seal resembles the quadruped kind, it greatly differs from all of them with respect to its feet; for, though furnished with the same number of bones as in quadrupeds, they are united to the body in such a singular manner, and so covered with a membrane, that they would rather resemble fins than feet, did not the sharp strong claws with which they are pointed show their proper analogy. The limbs, in fact, are converted into oars and paddles. The anterior pair have the arm and fore-arm so short, that little more than the paw advances from the body. The hinder limbs are directed backward, so as almost to seem like a continuation of the body; the thigh and leg are very short, and the foot is formed on the same plan as the fore-paw, the toes being in contact, however, and the web folded, when it is not in use as a paddle, but being spread out when the animal is swimming. When on land, or on masses of ice, the movements of the seal are particularly awkward, its body being forced onward by the action of the fore-limbs only, and the wriggling motion of the abdominal muscles; they accordingly seldom venture from the shore, but usually bask on the rocks; and when disturbed plunge immediately to the bottom of the water. The seals live in herds, more or less numerous, along the shores of the sea; and on uninhabited coasts they bring forth and suckle their young, and exhibit the most tender solicitude for their welfare. They are easily tamed, become strongly attached to their keepers, recognize them at a distance, and seem to be endowed with a very considerable share of intelligence. The form of their teeth and jaws shows them to be carnivorous; and their food consists of fish, crabs, and sea birds, which they are enabled to surprise while swimming. Seals swim with great rapidity and ease; and by a peculiar arrangement of their blood vessels, nearly similar to that which exists in the whale tribe, they can remain under water for a considerable time.

There are many species of these animals; some are found in almost every quarter of the globe, but chiefly in the frigid or temperate regions. These animals produce two or three young at a time; and they suckle them for six or seven weeks, generally in the cavernous recesses of rocks, after which they take to the sea. The young are remarkably docile; they recognize and are obedient to the voice of their dams amid the numerous clamors of the flock, and mutually assist each other when in danger or distress. Thus early accustomed to subjection, they continue to live in society, hunt and herd together, and have a variety of cries by which they encourage or pursue, express apprehension or success. When incited by natural desire, however, their social spirit seems to forsake them; they then fight most desperately; and the victorious male always keeps a watchful eye over those

females whom his prowess has secured. In some of the species there is a remarkable disproportion in the sexes; and some also are far more pugnacious than others.

The common seal, *Phoca vitulina*, abundant in the cool and frigid regions, is three to five feet long, and is much hunted for its skins, and for its oil and flesh. The skins though their covering is hair, not fur, are much valued. The harp seal (*P. grœnlandica*) is abundant on the Arctic coasts of Europe and America, and is killed in great numbers for its oil and skins. It is a very gregarious species, breeding on ice floes in the spring. There are several other species in the North Atlantic, while some species extend to the tropics. There is a second family of the *Pinnipedia*, known as the *Otariidæ*, or sea lions and sea bears, the former having only long coarse hair, while the latter have in addition a short, soft, and delicate fur, which, under the name of seal skin, is highly valued in commerce.

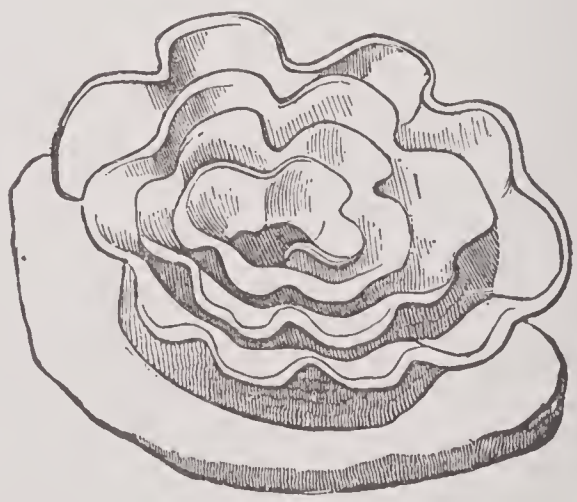
COMMON SEAL OR PHOCA VITULINA.

The Sea Lion (*q. v.*) is found on both coasts of the Pacific from California and Japan N., and there is an Antarctic species. The S. fur seals have been nearly exterminated. The celebrated N. species *Callorhinus ursinus*, which yields the valuable sealskin of commerce, is confined to the North Pacific, breeding only on two of the Pribilof Islands, in Bering Sea, and two of the Commander Islands, further W. See Furs: Bering Sea: Sea Elephant.

Seal, Great, a seal of the United States government, used in sealing treaties with foreign countries and other papers of high moment. It is in charge of the Secretary of State.

Sealed Orders, written instructions, generally to naval officers. The custom of having warships sail "under sealed orders" has arisen from the desire of maritime powers to prevent their plans from becoming known to the enemy. In the American navy such orders come from the President, and are delivered to a commander of a ship or squadron by a confidential messenger who knows nothing of their contents. Sometimes they are in cipher, but they are always sealed with the official seal of the Navy Department, and the package cannot be opened till the time marked on it, which is usually several hours after the hour of leaving port. By this precaution the newspapers are prevented from disclosing prematurely movements which may be of the greatest importance, and the spies of the enemy are rendered useless so far as their ability to discover the secret of such movements is concerned. Sailing under sealed orders is now the common naval practice in time of war.

Sea Lemon, *Doris*, a genus of gasteropodous mollusca, section Nudibranchiata, ("naked gilled"), family *Doridæ*. It is destitute of a shell, and moves by means of a broad ventral foot. The gills exist in the form of a circle of plumes in the middle of the back, at the posterior extremity of the body, and can be retracted at will within the body. The name sea lemon has been applied to these mollusks from their usually



SPAWN OF SEA LEMON.

yellow color and somewhat lemon-like shape. They may be found at low-water mark under stones and in similar situations. *D. tuberculata*, or the "sea lemon" par ex-

cellence, is about three inches in length, of a yellow color, and having the mantle warty.

Sea Letter, a document issued from the custom house, carried by every neutral ship on a foreign voyage in time of war. It specifies the nature and quantity of the cargo, the place whence it comes, and its destination. Called also a sea brief; a passport for the vessel and cargo.

Sealing Wax, a composition for sealing or securely fastening letters or packets. Sealing wax made of resin, and colored with vermillion, lamp-black, white lead, or orpiment, was made in the 16th century. It was long known as Spanish wax, and probably reached the Portuguese from India, and the rest of Europe through Spain.

Sea Lion, a popular name for the genus *Otaria;* specifically, *O.* (*Eumetopias*, Gray) *stelleri*, the hair seal of the Pribiloffs, or Steller's sea lion. The male attains a length of 11 or 12 feet, and a weight of about 1,000 pounds. Color golden rufous, darker behind, limbs approaching black. It is destitute of fur, and its skin therefore is of little value, but the hide, fat, flesh, sinews, and intestines are all useful to the Aleutian islanders. The hides yield excellent leather, oil vessels are made from the stomachs, the sinews are used for threads for binding skin canoes, and the flesh is considered a delicacy. Sea lions are found round Kamchatka and the Asiatic coast to the Kurile islands, and there is a colony of them at San Francisco protected by the National government. In heraldry, a monster consisting of the upper part of a lion combined with the tail of a fish.

Seal Leather, a leather manufactured from sealskins. It is light, strong, and tough, and is finished either in a large coarse grain for bootmakers, or as an enamelled or japanned leather.

Sealsfield, Charles, pseudonym of KARL ANTON POSTL, an Austrian author; born in Poppitz, Austria, March 3, 1793. He lived in the United States under the name of Charles Sealsfield, 1822–1826, and again 1827–1830. He wrote: "Sketches of Transatlantic Travel" (1834); "Life Pictures from Both Hemispheres" (1835). Among his novels are: "Tokeah; or, The White Rose" (1828); "Virey and the Aristocrats" (1834); "German-American Elective Affinities" (1839). He died near Soleure, Switzerland, May 26, 1864.

Sea Mat, or **Hornwrack,** *Flustra*, a genus of *Molluscoida*, class Polyzoa. The sea mat, which presents the appearance of a piece of pale brown seaweed, is a compound organism, produced by a process of continuous gemmation or budding from a single primitive polypide, which latter was in turn developed from a true egg. Each little polypide or zoöid of the sea mat possesses a mouth surrounded by a crown or circle of retractile, ciliated tentacles, a stomach, and intestine. *Flustra foliacea*, or the broad hornwrack, is a familiar species.

Sea Mouse, *Aphrodite*, a genus of dorsibranchiate Annelids or marine worms. The most notable feature in connection with the sea mouse consists in the beautiful iridescent hues exhibited by the hairs or bristles which fringe the sides of the body. The sea mouse inhabits deep water, and may be obtained by dredging, though it is frequently cast up on shores after storms. The common species, *A. aculeata* of the British and French coasts is six or eight inches long and two or three inches in width.

Sea Mussel, a family of mollusks, order *Lamellibranchiata*, comprising acalepha which have the shell equivalved, oval or elongated, and the epidermis thick and dark. They seek concealment, and spin a nest of sand, or burrow in mud banks. There are more than 100 living, and 250 fossil, species.

Seance, a sitting; a session, as of some public body; specifically applied by spiritualists to a sitting with the view of evoking spiritual manifestations or of holding communication with spirits.

Sea of Tiberias. See GALILEE, SEA OF.

Sea Owl. See LUMPFISH.

Sea Pike. See GARFISH.

Sea Pink, *Armeria maritima*, a small plant, the type of the genus *Armeria*, natural order *Plumbaginaceæ*. It is found on all the coasts of Great Britain. The thrift, *Armeria vulgaris* is found in the Middle and Southern States, near the sea coast.

Search Light, an electric arc light the rays of which are collected into a parallel beam that may be projected to a great distance and turned in any direction. Search lights are used on naval vessels to show at night the approach of hostile vessels, and to detect floating mines or torpedo boats; also for illuminating signal flags and for signaling by long and short flashes. This system of signaling is used in the army also. Messages may be sent 20 miles or more. During the American-Spanish War search lights were effectively employed by the United States navy and also for purposes of coast defenses. The light is also used in the commercial marine, by liners, etc. A search light on exhibition in Chicago in 1893 threw a beam that was visible for 85 miles and that made fine print legible 8 miles from the arc. See ELECTRIC LAMP.

Search, Right of, in international law, the right of belligerents, during war, to visit and search the vessels of neutrals for contraband of war. Some powerful nations have, at different times, refused to submit to this search; but all the highest authorities upon the law of nations ac-

knowledge the right in time of war as resting on sound principles of public jurisprudence, and upon the institutes and practices of all great maritime powers. The duty of self-preservation gives belligerent nations this right; and as the law now stands, a neutral vessel refusing to be searched would from that proceeding alone be condemned as a lawful prize. The right of search, however, is confined to private merchant vessels, and does not apply to public ships of war. The exercise of this right must also be conducted with due care and regard to the rights and safety of vessels. A neutral is bound not only to submit to search, but to have his vessel duly furnished with the necessary documents to support her neutral character, the want of which is a strong presumptive evidence against the ship's neutrality, and the spoliation of them is still stronger presumption. There may be cases in which the master of a neutral ship may be warranted in defending himself against extreme violence threatened by a cruiser grossly abusing his commission; but, except in extreme cases, no merchant vessel has a right to say for itself, nor any armed vessel for it, that it will not submit to visitation or search, or be carried into a proximate court for judicial inquiry. If, on making the search, the vessel be found employed in contraband trade, or in carrying enemies' property, or troops or dispatches, she is liable to be taken and brought in for adjudication before a prize-court. The above doctrine has been fully admitted in England; but the government of the United States has energetically refused to submit to the right assumed by the English of searching neutral vessels on the high seas for deserters, and other persons liable to military and naval service. This question, yet not specifically settled, was one of the chief causes of the War of 1812.

Search Warrant, in law, a warrant granted by a justice of the peace to enter the premises of a person suspected of secreting stolen goods, in order to discover and seize the goods if found. Similar warrants are granted to search for property or articles in respect of which other offenses are committed, as base coin, coiners' tools, arms, gunpowder, nitroglycerin, liquors, etc., kept contrary to law.

Searle, January. See PHILLIPS, GEORGE SEARLE.

Sears, Lorenzo, an American rhetorician; born in Searsville, Mass., April 18, 1830; was graduated at Yale University in 1861, and at the General Theological Seminary of New York in 1864; held various charges in New England in 1864–1885; was Professor of Rhetorie and English Literature at the University of Vermont in 1885–1888; and became Professor of Rhetoric and American Literature at Brown University in 1890. His publications include: "The History of Oratory" (1896); "The Occasional Address, Its Composition and Literature" (1897); "Principles and Methods of Literary Criticism" (1898); "An Introduction to Famous After-Dinner Speeches" (1901); "A Historical Introduction to the Library of Modern Eloquence" (1901); etc.

Sea Serpent, the name given to gigantic animals, presumedly of serpentine form, which have been frequently described by sailors and others, and which are believed by many naturalists to exist in the sea depths, especially in tropical oceans. One of the best known accounts of the sea serpent is that of Captain McQuhae. This account was published in 1848. Captain McQuhae commanded H. M. S. "Dædalus," and encountered the serpentine form in the South Atlantic Ocean, near the Tropic of Capricorn, and not very far from the coast of Africa. It was not, as in other cases, in bright and fine weather, but in dark and cloudy weather, and with a long ocean swell. The animal was swimming rapidly, and with its head and neck above water. Captain McQuhae in his report to the Admiralty describes it with confidence as "an enormous serpent, with head and shoulders kept about four feet constantly above the surface of the sea"; and he adds: "As nearly as we could approximate by comparing it with the length of what our maintopsail yard would show in the water, there was at the very least 60 feet of the animal *á fleur d'eau,* no portion of which was, to our preception, used in propelling it through the water, either by vertical or horizontal undulation. It passed rapidly, but so close under our lee quarter that had it been a man of my acquaintance I should have easily recognized his features with the naked eye; and it did not, either in approaching the ship or after it had passed our wake, deviate in the slightest degree from its course to the S. W., which it held on at the pace of from 12 to 15 miles per hour, apparently on some determined purpose. The diameter of the serpent was about 15 or 16 inches behind the head, which was without any doubt that of a snake; and it was never during the 20 minutes that it continued in sight of our glasses once below the surface of the water; its color a dark brown, with yellowish white about the throat. It had no fins, but something like the mane of a horse, or rather a bunch of seaweed, washed about its back." About the same time the testimony of another witness, Lieutenant Drummond, appeared, and was found to differ in some important points from the account of the animal given by Captain McQuhae and the figures published with his approbation, particularly in ascribing a

more elongated form to the head, in the mention of a back fin, whereas Captain McQuhae expressly says that no fins were seen, and in a lower estimate of the length of the portion of the animal visible. Lieutenant Drummond's words are: "The appearance of its head, which with the back fin was the only portion of the animal visible, was long, pointed, and flattened at the top, perhaps 10 feet in length; the upper jaw projecting considerably; the fin was perhaps 20 feet in the rear of the head, and visible occasionally; the captain also asserted that he saw the tail, or another fin about the same distance behind it; the upper part of the head and shoulders appeared of a dark brown color, and beneath the under jaw a brownish white. It pursued a steady and undeviating course, keeping its head horizontal with the water, and in rather a raised position, disappearing occasionally beneath a wave for a very brief interval, and not apparently for the purposes of respiration. It was going at the rate of perhaps from 12 to 14 miles an hour, and when nearest was perhaps 100 yards distant. In fact, it gave one quite the idea of a large snake or eel." Lieutenant Drummond's account is the more worthy of regard, as it is derived from his log-book, and so gives the exact impressions of the hour, while Captain McQuhae's was written from memory after his arrival in England. Sir Richard Owen thought the animal was a gigantic seal; a supposition, however, which does not at all agree with the description given.

In 1875 a battle between a sea serpent and a whale was viewed from the deck of the "Pauline" of London, Captain Drevar, when proceeding with a cargo of coal from Shields to Zanzibar. After a severe storm she found herself off Cape San Roque, where several sperm whales were seen playing about her. Suddenly, starting straight from the bosom of the deep, a gigantic serpent rose and wound itself twice round the largest of the whales, which it proceeded to crush in genuine boa constrictor fashion.

Of no less a ship than H. M. yacht "Osborne" the captain and officers in June, 1877, forwarded an official report to the admiralty containing an account of a sea serpent's appearance off the coast of Sicily on the 2d of that month. "The time was 5 o'clock in the afternoon. The sea was exceptionally smooth, and the officers were provided with good telescopes. The monster had a smooth skin, devoid of scales, a bullet-shaped head, and a face like an alligator. It was of immense length, and along the back was a ridge of fins about 15 feet in length and 6 feet apart. It moved slowly, and was seen by all the ship's officers." This account was further supplemented by a sketch from the pencil of

Sea Serpent

Lieut. W. P. Hynes of the "Osborne," who to the above description adds that the fins were of irregular height, and about 40 feet in extent; but, "as we were passing through the water at 10½ knots, I could only get a view of it 'end on.'" It was about 15 or 20 feet broad at the shoulders, with flappers or fins that seemed to have a semi-revolving motion. "From the top of the head to the part of the back where it became immersed I should consider about 50 feet, and that seemed about a third of the whole length. All this part was smooth, resembling a seal." These instances are but examples of the many cases in which narratives of the most circumstantial character have been recorded regarding the appearance of serpentine animals, usually in tropical seas.

As will readily be admitted, the chief point at issue is that of the zoölogical determination of the forms reported to have been seen. Gigantic cuttlefishes, now proved to have a veritable existence, might in many cases imitate an elongated marine form, swimming near the surface of the sea. It is by far the most plausible theory of sea serpent existence to suppose that most of the animals described are really giant cuttlefishes of the Loligo or squid type. These creatures may attain a length of 40 feet or more inclusive of their tentacles, and as they swim along the surface of the sea backward the tail fin might well be mistaken for a serpentine head and its fin or ridge, while the tentacles and wash produced by the animal's movements would impart an exaggerated length to the body. Even the incident already described in the case of the "Pauline" might be explicable on the theory that giant cuttlefishes attacked the whales, and that the so-called serpents were really the arms or tentacles of the squids. As regards the "Pauline" case, it may be remarked that the latitude in which the incident occurred was one most unlikely for any sea snakes to be found. Certain fishes, too, such as the basking shark (*Selache maxima*), would also under certain circumstances appear as unusual marine forms; and the well-known tape fishes (*Gymnetrus banksii*) and other ribbon fishes would very accurately reproduce the features of a marine snake, especially when these fishes, as sometimes happens, have grown to an immense size. The marine snakes or hydrophidæ of the Indian Ocean would also serve to personate the "great unknown" if unusually large. It seems certain that in the immense development of ordinary marine animals may be found a probable clue to the sea serpent mystery. Gosse entertained the notion that it might be possible to explain certain sea serpent stories on the theory that some of the gigantic marine reptiles with whose

fossils we are well acquainted might still be in existence in the sea depths, and occasionally make their appearance at the surface of the ocean. Cases of mere serpentine appearances assumed by certain animals are not to be confused with cases in which a single animal has presented a serpentine aspect. Flocks of birds known as shags swimming close to the water's edge might personate a sea serpent swimming along the top of the water; but a flock of birds would have been readily detected by Captain McQuhae, and by many other observers who have beheld the unknown form from a relatively near distance.

Apart altogether from these historical or semi-historical examples, the sea serpent has had continuous existence in folklore everywhere, whether among the Eskimo, Fijians, Japanese, Icelanders, Basques, Red Indians, or Chinese. The notion is natural and easy of belief, and the human desire for wonders is sufficient to account for any belief. In 1898 there was dug up in Kansas the fossil remains of what might be termed a prehistoric sea serpent, admirably preserved. Its scientific name is *Mosasaurus*. It lay extended in a double, sinuous curve, and was 28 feet long. This creature seems to have united the long, slender form of a snake and the short fingered paddles of the modern whale. A decidedly snake-like characteristic of it was its teeth. In addition to having teeth on the jaws it had them also in the bones of the palate, in the roof of the mouth. The jaw bones, moreover, were very loose. The Mosasaurus could use them like arms, and with the help of the teeth in the palate could draw down its prey into its throat when too large to swallow directly.

SEA SERPENT: MOSASAURUS, RESTORED.

Prof. Henry F. Osborn, of the Museum of Natural History, New York city, was very positive in the assertion that this creature was a purely marine animal. It was not an amphibian, like the present crocodiles and lizards, and it was not to be confounded with the extinct monsters called dinosaurs. It is thought to have been a small one of its class. Naturalists like Le Conte and Cope expressed the opinion that the largest ones were 60 to 70 feet long. It lived at a time when Kansas, as well as the whole Mississippi valley, was a vast lake or inland sea.

Sea Shore, in law, the ground between the ordinary high-water mark and low-water mark.

Sea Sickness, a nausea, or tendency to vomit, which varies, in respect of duration, in different persons upon their first going to sea. With some it continues only for a day or two; while with others it remains throughout the voyage. In some persons its violence is prevented by small doses of opium, or by soda water, or saline draughts in the effervescent state. Liniments and plasters containing opium applied to the pit of the stomach have also been recommended, as mitigating or even preventing this most annoying malady. The violence of the attacks not only varies in different individuals at different times, but the same person who escapes in one voyage may suffer severely in another. It almost always ceases on landing, though more or less giddiness may prevail for some hours, the patient when walking feeling as if the earth were rising up under his feet. Infants and aged persons are supposed to possess a comparative immunity from sea sickness, while as a general rule women suffer more than men. The immediate or exciting cause of sea sickness is variably attributed to the motion of the vessel, or to the effect produced on the eye by moving objects, and by that sense conveyed to the brain.

Seaside Grape, a small tree of the genus *Coccolobea* (*C. uvifera*), natural order *Polygonaceæ*, which grows on the sea coasts of Florida and the West Indies. It has clusters of edible fruit somewhat resembling the currant in appearance, a beautiful hard wood which produces a red dye, and yields the extract known as Jamaica kino.

Sea Slug, in zoölogy, any individual of the *Opisthobranchiata*. The name is sometimes confined to the *Nudibranchiates*.

Sea Snake, any individual of the family *Hydrophidæ*. They have depressed heads, dilated behind and covered with shields. Their bodies are covered with square plates; their tails are very much compressed and raised vertically, so as to aid them in swimming. They are very venomous; but rarely, if ever, exceed four feet in length. They are found off the coast of India, in the salt water channels of the Sunderbunds, in the seas around the Indian islands, and in the Pacific, but at no great distance from land. They are eaten in Tahiti.

Sea Snipe, the popular name of a fish, *Centriscus scolopax*.

Season, the alterations in the relative length of day and night, heat and cold, etc., which take place each year. In the United States there are four seasons, spring, summer, autumn, and winter. The Anglo-Saxons reckoned only three, spring, summer, and winter, the words for which are all from Anglo-Saxon; AUTUMN (*q. v.*) was borrowed from the Romans. In India there are but three well-marked seasons of four

months each, the hot (February–May), the rainy (June–September), and the cold (October–January). The essential astronomical fact on which the recurrence of the successive seasons depends is that the axis of the earth always points in the same direction, whatever portion of the orbit the earth may at the time be traversing. The inclination of the equator to the ecliptic is 23° 27′. On June 21, when the sun is at the highest point of the ecliptic, the North Pole necessarily inclines toward the sun, and is as much irradiated as it ever can be by his beams, while the South Pole, on the contrary, is as little. It is therefore midsummer in the Northern and midwinter in the Southern Hemisphere. Six months later, Dec. 21, the South Pole points toward the sun. It is therefore now midwinter in the Northern and midsummer in the Southern Hemisphere. At the intermediate periods (March 21 and Sept. 21), the axis of the earth is at right angles to the direction of the sun; hence, in both hemispheres it is the equinox, the vernal at the former date in the Northern and at the latter in the Southern Hemisphere.

Sea Spider, or **Spider Crab,** a marine crab of the genus *Maia* (*M. squinado*). Its body is somewhat triangular in shape, and its legs are slender and generally long. It lives in deep water, and is seldom seen on the shore.

Sea Squirts, a name sometimes applied collectively to all the Tunicata, or more especially to the genus *Ascidia*. The name "sea squirts" has been applied from their habit of emitting jets of water from the orifices of the body when touched or irritated in any way.

Sea Surgeon, or **Surgeon Fish** (*Acanthurus chirurgus*), a fish belonging to the teleostean section of Acanthopteri, so named from the presence of a sharp spine on the side and near the extremity of the tail, bearing a resemblance to a surgeon's lancet. It occurs on the Atlantic coasts of South America and Africa, and in the Caribbean seas. Its average length is from 12 to 19 inches.

Sea Swallow, a name given to the common tern and also to the stormy petrel.

Sea Toad, a name given to the great spider crab (*Maia* or *Hyas araneus*), found on British coasts at low-water mark.

Seaton, William Winston, an American journalist; born in King William co., Va., Jan. 11, 1785, was educated in a private academy. He early engaged in journalism; settled in Washington, D. C., in 1812, and became associated with his brother-in-law, Joseph Gales, Jr., in editing and publishing the "National Intelligencer." In 1812–1820 they were the only reporters of Congress, one working in the Senate and the other in the House of Representatives. Along with Mr. Gales his publications include: "Annals of Congress: Debates and Proceedings in the Congress of the United States from March 3, 1798, till May 27, 1824" (42 vols. 1834–1856); "Register of Debates in Congress from 1824–1837" (14 vols.), etc. He died in Washington, D. C., June 16, 1866.

Seattle, city and county-seat of King co., Washington; on the E. shore of Puget Sound (*q.v.*), and on the Seattle and International, the Northern Pacific, the Great Northern and the Columbia and Puget Sound railroads, 28 miles N. of Tacoma; the largest and most enterprising city in the Pacific Northwest, the commercial emporium of Puget Sound and the metropolis of Washington. Beside the above-named railroads which control their own terminals, there are provisions for the Burlington, Canadian Pacific, Union Pacific, Southern Pacific, and Chicago, Milwaukee and St. Paul systems. The Great Northern has already tunneled the city for a distance of one mile with double track extending from Virginia street on the north to Main street on the south, and has constructed a union depot of large proportions—the entire cost of all exceeding $2,500,000. The city is built on undulating ground, with ridges and valleys running N. and S., and from the Sound a remarkable view is presented by the steep hills. Within sight of the city is the broad Sound itself and Elliot Bay with the Olympic Mountains to the west and the Cascades in the northeast and south, ranging in height from 3,000 to 8,000 feet; Mt. Rainier, only 70 miles away, standing out alone at an altitude of 14,555 feet. Because of the volcanic conditions which produced these upheavals, the waters of Elliot Bay and Puget Sound are of very great depth, often reaching 500 feet.

History.—Although Seattle was founded only 51 years ago, it is situated in a region which has been known for more than 300 years. In 1592 Juan de Fuca, a Greek pilot in Mexican employ, passed the straits and named them for himself; in 1792 the English Captain George Vancouver explored the coast, leaving his own name on the great island that still bears it, and naming the splendid inland sea "Puget Sound" in honor of one of his lieutenants. Lewis and Clark in 1805-6 described the region with enthusiasm; in 1810 there were settlements made by the fur companies, and the trading post of Astoria was established by John Jacob Astor, a native of Holland, but a citizen of the United States. Marcus Whitman and his missionaries came to Eastern Washington in 1836. In 1845 American settlers began to arrive on the shore of Puget Sound; in 1851-5 the town of Seattle was located, and in 1853 mapped out and named after a friendly Indian chief. It took Seattle three

years to gain 150 inhabitants. In 1856 an Indian war occurred; the population was reduced somewhat, but it slowly grew again. In 1854 the first school was taught, and in 1861 the territorial university was established. Since the admission of Washington to statehood it is known as the University of Washington. In 1870 there was a population of about 1,200 people, and several stores and saw-mills were located. The first railroad connection was made in 1884, and that gave Seattle its first great impetus. Six years later a destructive fire occurred and burned over an area of sixty acres, causing a loss of $10,000,000. The enterprise and energy of the people, however, turned this destruction into an advantage, and a new city on much better lines, with imposing buildings, was soon erected.

Situation.—The two advantages of Seattle are: Its admirable location on Elliot Bay on the lower east shore of Puget Sound, 40 miles S. of the straits of Juan de Fuca, 130 miles from the Pacific; and, secondly, its position about midway of the coastline of the great and fertile valley between the Sound and the Cascade mountain range some 30 miles to the eastward of it. Elliot Bay affords harborage for the largest sea-going vessels, and with its landward connection of railways Seattle has become a crowded sea-port and distributing center for steam lines up and down the coast and for trans-Pacific commerce to the Hawaiian Islands, the Philippines, Japan, China, Siberia, etc., as well as less regular trade with South America, Australia and Europe. On the other hand, "the Sound," as the Puget Sound valley is familiarly called, is a country of great natural wealth, and the whole State of Washington has taken high rank for its agricultural and mineral resources, great quantities of which find their way to the world through Seattle. Just east of Seattle is Lake Washington, about 27 miles long and 2 to 6 miles wide, affording deep fresh water harborage, which is to be availed of by the canal, 8 miles long and 100 feet wide, from the lake to deep water in the Sound, under construction by the United States government at a cost of $3,000,000. The smaller waters of Lake Union and Green Lake are within the city limits, and the Duwamish river flows through it also. About 14 miles west of the city is the United States navy yard at Port Orchard, with a deep, land-locked harbor and the largest dry-dock on the Pacific Coast, 627ft. long, 39 ft. deep, 67 ft. wide at the bottom and 130 ft. at the top, costing above $600,000. The navy yard itself is a very complete plant for construction and repairs, with wharves, shops, quarters, etc., and has cost several millions of dollars. With its 1,000 workmen and its many needs, it is a marked factor in the activities of the city.

Seattle

Magnolia Bluff is a United States military station of 1,000 acres at the extreme N. W. corner of Seattle, heavily fortified where it commands the harbor, and garrisoned with a couple of regiments. The importance of the place, with its extraordinary advantages of location, both seaward and landward, is recognized by the government. One of the New York papers said of it in 1900: "There is only one city that has grown up naturally, unassisted by Eastern speculators and town-site promoters. That city is Seattle, with a history of forty years and a population of 80,000."

Local Features.—The climate of Seattle is fine, moderate and wholesome; malaria is unknown. The average extreme cold during 3 years was 20° and of heat 89°; the mean temperature per annum, 54½°. The average rain and snowfall is 34.26 inches. The city has an area of 28 square miles; 105 miles of streets; a system of city-owned waterworks, costing $2,500,000, the water being from Cedar river 22 miles distant, with 230 miles of city mains, affording a net income of nearly $380,000 in 1905; and a sewer system covering 135 miles. The streets are lighted by gas and electricity; the electricity for light and power in many of the manufacturing establishments coming from a plant at the Snoqualmie Falls, about 24 miles from Seattle, the water of which has a drop of 270 feet, 126 feet higher than Niagara. The plant now develops 7,500 h. p. and may be expanded from time to time to 100,000 h. p. as the needs of the city may arise. There is a public school enrollment of over 18,000 pupils, with 33 school buildings. The annual cost of maintaining the city government is about $1,000,000. The annual death rate averages 7.36 per 1,000. There are 10 foreign consular offices in the city; it has 50 wharves for its shipping; 110 miles of street railway; 5 daily papers and over 50 weekly and monthly periodicals; 20 Atlantic and Pacific steamship companies are represented here, and all the great insurance companies, while—with never a speculative "boom"—there are millions of Eastern capital invested in the land, buildings, street car lines, stock, bonds, etc. There are a number of pretty parks, the principal ones being Lincoln, Volunteer, Woodland, Washington, Denny and Kinnear, while the well-kept grounds of Fort Lawton and of the State University, with its 35 acres between Lakes Union and Washington, add to their attractions. The streets vary from 40 to 250 feet in width, the more important avenues being variously paved. The State University has a faculty of 30, and over 600 students; the legislative appropriation for it in 1904-5 was $300,000. Besides, there are a Methodist College, the Seattle Seminary, two Roman Catholic institutions—the Im-

Seattle

maculate Conception College and the Academy of Holy Names—and a number of private and parochial schools. The entire expenditure on the public schools for 1903 (including new buildings, etc.) was $800,000. The Public Library contains above 60,000 volumes, and a new building for it costing $200,000 was the gift of Andrew Carnegie. The notable public buildings are the County Court House, the Federal building (for post-office, court, custom house, etc.), the Providence Hospital, the High School, the Opera House, the Alaska Building, and the seven University buildings. There are seven large hotels, three good theaters and a sufficiency of excellent clubs.

Manufacturing.—The industrial interests of Seattle are very active and rapidly growing. Between 1890 and 1900 the number of establishments, capital employed, cost of materials used, and value of product considerably more than doubled, while in the five years thereafter the growth was even faster. The estimate for 1905 was: Industrial establishments, 1,600; capital invested, $20,000,000; employees, 20,000; annual wages, $17,000,000; and value of product, $60,000,000. The lumber and shingle mills are among the most important of the industries. Many years ago Captain Renton, who later became blind, established a lumber mill on Blakely harbor, just across the bay from Seattle. That plant is to-day the largest sawmill in the world. It has a capacity of 275,000 feet every 10 hours, it runs night and day, and its annual output is from 100,000,000, to 125,000,000 feet. It owns a large fleet of ships, it is constantly building more at its own yards, it loads them at its own wharves, and sends its product to all parts of the world. There are also busy shipyards—building not only wooden sailing vessels and iron steamships, but battleships for the United States navy—as well as iron foundries, boiler works, rolling mills, flour mills, wood-working plants, canning and preserving of fruits, vegetables and fish, slaughtering and meat-packing, furniture, carriage and wagon factories, breweries, drain-tile and brick works, tanneries, and many other productive industries.

Commerce.—The splendid situation of Seattle has made its commercial growth certain, although it was 8 years from the first of its railroad connections to the first of its foreign steamship lines—the one to Japan, 1896. In the following year gold was found in Alaska and on the Yukon. Immediately Seattle merchants ordered goods in a way that amazed those from whom they purchased. Failures were predicted, but Seattle, being prepared, secured two-thirds of all the Alaska trade—and kept it. Seattle will always be the gateway to our Alaskan possessions, the importance of which few people E. of the Mississippi realize. Not less than 30,000 people, it is estimated, pass to and from Alaska through Seattle every year. This travel is largely foreign, and therefore does not enter into the population of the city, though at times it very materially swells that population temporarily. The Alaskan-Klondike gold product made a United States Assay Office necessary, and the same was organized on July 15, 1898. On January 1, 1906, the amount of gold received at this office aggregated $115,890,894.04. The year 1898 also gave a new market in the Philippines and made that a stopping place for further Oriental trade. Of the United States exports to the Philippine Islands a very large proportion goes from Puget Sound, while the rest is sent from San Francisco and New York City. The great growth of Seattle commerce may be observed from the following: Imports in 1895, $4,178,820; in 1900, $16,178,775. Exports in 1895, $7,956,683; 1900, $29,062,532. For the twelve months ending December 1, 1905, the imports aggregated $41,037,706, and exports $68,852,471. The coastwise trade greatly exceeds the foreign trade to both San Francisco and Alaska, and to some 200 towns along the shores of Puget Sound. The total outward and inward water commerce of Seattle, foreign and coastwise, in 1905 reached the enormous sum of $109,890,177, and future business promises to be greater.

Finances.—The manufactures, trade and commerce of this North Pacific capital need and have received great financial resources. The deposits of all the 15 banks at the end of 1905 aggregated $35,850,041; the bank clearings of that year, the usual gauge of business activity, being $301,600,202—a gain in one year of more than $79,000,000, or one and one-third times more than what they were in 1900. In the same year, the total receipts by the city were $5,007,993, the total expenditures, $4,521,610; and the income from water tax was $487,787, while the expenditures reached $365,912. Thus the city directly had a surplus at the end of 1905 of $486,383, and a surplus from water tax of of $121,873; or a total surplus of $608,258. The bonded debt of the city at the end of 1905 was $4,635,000, the judgment debt $187,000. To this must be added the local improvement debt of $2,675,354, the latter running against abutting property only. The total valuation of real estate and personal property for taxable purposes at the close of 1905 was $70,153,753, and this made a net per capita debt of $24.31 and a property valuation per capita of $412.66. All the balances of the city, it will therefore be seen, are on the right side. Pop. (1890), 43,000; (1900), 81,000, several adjoining suburbs having a pop. of 10,000 more; est. (1905), 165,000 for city, and 20,000 for suburbs; (1910) 237,194. ALDEN J. BLETHEN.

Sea Urchin, one of the *echinoids*, or *Echinidæ*, an order of *Echinodermata*. They have the body covered with a calcareous crust or shell, of an extremely porous structure, in polygonal plates nicely adapted to each other, and increasing by additions to the edges of each plate, so that the shell may enlarge with the enlargement of the animal, while new plates are also added around the superior orifice. The shell is pierced with rows of holes for the ambulacra, and is externally covered in a living state with a membrane, sometimes very delicate, sometimes thick and spongy, which communicates by many delicate processes with the interior and unites the bases of all the spines. The spines differ very much in the different genera and species, in their length, strength, number, and arrangement; they are attached to tubercles on the surface of the shell by cup-like bases capable of working upon the tubercles in the manner of a ball-and-socket joint; and they are moved by means of the connecting membrane so as to be employed in locomotion. In some species they seem to be the principal organs of locomotion; in others the ambulacra are so.

Seaweed, a plant growing wholly in water, fresh or salt. Some are so small and delicate that they can be seen only with a microscope, and others are of such immense growths that they almost fill up the seas in which they live. The great seaweeds called sea aprons are often several hundred feet long. Seaweeds are not much like the plants that grow on land. They have no roots, and therefore do not get any of their food from the earth, but live entirely from the water. Many float around in the water and many are fastened to rocks at the bottom of the sea, to which they are made fast by a kind of stem with a sticky surface. They have no real leaves, but have parts which answer for leaves. Sometimes these are like wavy thongs, sometimes like crumpled threads; others are like fans, balloons, belts, delicate ribbons, or shreds of jelly. Some are thick and tough, others thin and tender; and they are of many colors. Those in deep water are mostly brown of different shades, and those nearer the surface and often floating are mostly green; the pinks and reds are found chiefly in shallow water near the shore.

In the bottom of the ocean the seaweeds form great groves and woods which lace their branches together and make grottoes and galleries. Many are larger than any trees on land, and as they are many colored they are probably far more beautiful than our forests. The seaweeds that float often form islands which drift about in the currents. Not far from the Azores is an immense bank of seaweed called the Sargasso Sea from the kind of weed (sargassum) of which it is made up. When Columbus was on his way to the New World, he was greatly astonished at this floating mass, and his men feared that they had come to the end of the navigable sea. Sometimes these plants gather round ships so as almost to stop them.

Many of the seaweeds are very useful to man. In Eastern Europe they are dried for fuel and put on land for manure. The seaweed called bladder wrack and knobbed rack were once much used for making kelp. In Northern Europe these are fed to pigs, and when food is scarce even horses and cattle thrive on them. In Holland a kind of seaweed is used in building dykes or banks to keep the sea from flowing on to the land. and the same kind is also used for stuffing mattresses and cushions and for packing goods. The Sandwich Islanders, the Chinese and Japanese, the Icelanders, and many other people eat various kinds of seaweeds. The edible birds' nests of the Chinese are said to be built by swallows out of a kind of seaweed which has much gelatine in it. Another kind in China contains so much gelatine that it is largely used for making glue and varnish. Among the most useful of the seaweeds is that commonly called Irish moss or carrageen, which takes the place of isinglass in making blancmange and jellies, and is used also in making sizing and lager beer. It is a deep rich green when gathered, but is bleached white by wetting with sea water and drying it. Dulse, a purple seaweed, called dillesk by the Irish, is also collected and used for food.

Seaweeds belong to the lowest class of flowerless plants. They do not have seeds, but grow from spores, as do lichens.

Seawell, Molly Elliot, an American author; born in Gloucester co., Va., Oct. 23, 1860. She published: "The Sprightly Romance of Marsac"; "Hale Weston"; "Twelve Naval Captains" (1897); "A Virginia Cavalier" (1896); "The House of Egremont" (1901); etc.

Seay, Abraham J., an American jurist; born in Amherst co., Va., Nov. 28, 1832; was taken by his parents to Osage co., Mo., in 1835, and reared on a farm. In 1861 he entered the Union army and served throughout the war, participating in 28 actions, including the campaigns of Vicksburg, Chattanooga and Atlanta, and the march to the sea; became a colonel of volunteers. He was circuit judge in 1875-1887, and chief-justice of the supreme court of Oklahoma in 1890-1892; was governor of that Territory in 1892-1893; then engaged in banking, stock-growing and farming.

Sebaceous Glands, glands having small ducts which open within the mouth of hair follicles and supply them with sebaceous matter. Sometimes there are several to one hair. The largest are on the sides of

the nose, and often become unduly charged with pent up secretion.

Sebamide, in chemistry, a crystalline body obtained by acting on ethyl-sebacic ether with ammonia; symbol $C_{10}H_{20}N_2O_2 = (C_{10}\overset{H_{16}}{H_4}O_2)''\}N_2$ It is neutral, and forms microscopic needles, insoluble in cold water and in ammonia, slightly soluble in boiling water, but very soluble in boiling alcohol. Water gradually converts it into ammonium sebate.

Sebastes, in ichthyology, a genus of *Scorpænidæ,* with about 20 species, widely distributed in temperate seas. Head and body compressed; body covered with scales of moderate or small size, without appendages, villiform teeth in jaws, on vomer, and palatine bones. They range from one to four pounds in weight, in general appearance resemble the SEA PERCHES (*q. v.*), and are esteemed as food.

Sebastian, Dom, King of Portugal; born in Lisbon in 1554; ascended the throne at three years of age, on the death of his grandfather, John III. Possessed of a romantic disposition and an extravagant admiration of the glories of chivalry, he rashly determined to carry on war against the Moors in Africa, hoping thereby to effect something for Christianity and the fame of Portugal. He accordingly equipped a fleet and an army, which comprised the flower of the Portuguese nobility, and sailed for Africa in 1578, at the age of 23 years. A general engagement soon took place at Alcacer-el-Xebir, and the ardor of the young king bore him into the midst of the enemy, who were already pouring on the rear of his troops. Sebastian fought with the most determined bravery, while most of his attendants were slain by his side. He at length disappeared; and so complete was the slaughter that not more than 50 Portuguese are said to have survived this wild and ill fated expedition. The mystery which involved the fate of this royal warrior led several adventurers to assume his person and his claims, but there seems to be no doubt that he died on the field of battle. His death is supposed to have occurred Aug. 4, 1578.

Sebastian, St. See ST. SEBASTIAN.

Sebastiani, François Horace Bastien, Comte, a Marshal of France; born in Porta d Ampugnano, Corsica, Nov. 10, 1772. Entering the French army in 1789, he became one of Napoleon's most devoted partisans, and advanced rapidly. He fought at Marengo, executed some important diplomatic service in Turkey in 1802–1803, after which he became general of brigade and was wounded at Austerlitz. In 1806 he was again deputed to Turkey, this time to break the alliance of the Porte with Russia and England. His mission was successful, and Turkey declared war on the allies. Thereupon the English fleet forced a passage through the Dardanelles and cast anchor before Constantinople. Sebastiani, however, speedily put the coast batteries in a state fit for action and got several small gunboats afloat. But the deposition of the Sultan and the treaty of Tilsit put an end to the French intrigues in Turkey, and Sebastiani was recalled (June, 1807). He subsequently commanded the 4th French army corps in Spain, and distinguished himself in the Russian campaign of 1812 and at Leipsic. On the exile of Napoleon to Elba he gave in his adherence to the Bourbon government, but joined his old master on his return. After the revolution of 1830 he held for brief periods the portfolios of naval and foreign affairs, and the embassies to Naples and London, but was more distinguished for his elegance and graceful demeanor in the Parisian salons than as a politician or administrator. He was made a Marshal of France in 1840, and died in Paris, July 20, 1851.

Sebastopol, or **Sevastopol,** a fortified town and seaport of European Russia, on the W. coast of the Crimea. It stands on a creek on the S. side of one of the finest bays in the world, the Etenus of Strabo, which is defended by strong forts on both sides. In 1853 Russia demanded from the Turkish government guarantees for the rights of the Greek Christians of Turkey, which the Porte believed to involve an actual abdication of its sovereign rights, and which it therefore refused to concede. This led, in the same year, to the beginning of the Eastern or Crimean War, in which France, England and Sardinia took sides with Turkey, on the ground that the existence of the latter empire, and the equilibrium of political power in Europe, were endangered by Russia. The armies of the allies effected a landing at the Bay of Eupatoria, Sept. 14, 1854. On their S. march toward Sebastopol they encountered the Russian forces, commanded by Prince Menzikoff, on the banks of the Alma. A bloody battle was fought (Sept. 20), in which the Russians were compelled to retreat. On Sept. 25 the British forces seized Balaklava, and on Oct. 9 the regular siege of the S. portion of Sebastopol commenced, the Russians having sunk vessels in the entrance to the harbor and thus rendered the city unassailable by maritime force. On Oct. 25 and Nov. 5, the Russians vainly attempted to annihilate the besieging forces in the battles of Balaklava and Inkermann, but afterward confined themselves mainly to the defensive, their frequent sorties being intended more to harass and retard the siege than to relieve the place definitely. Among these conflicts some assumed almost the character of regular field

battles; for instance, an unsuccessful attack of the French on a new redoubt (Feb. 23, 1855), their first assault on the Malakoff and Redan (June 18), and the battle of the Tchernaya (Aug. 16), in which the Russians, numbering 50,000 infantry and 6,000 cavalry, made a last effort to break the aggressive force of the enemy. The trenches having been driven so near the Russian defensive works that another assault could be ventured, the final bombardment was opened Sept. 5, and lasted for three days. On Sept. 8 the Malakoff and Redan were stormed and taken by the allies after a desperate struggle. The Russians, after having blown up their extensive fortifications on the S. shore of the harbor, retreated to the N. side, which the allies never seriously attempted to conquer. The latter, having destroyed the costly docks, arsenals, and ship yards of Sebastopol, remained inactive in their camps, and, with the exception of the capture and sack of Kertch, on the Strait of Yenikale, no further feats of arms were accomplished. The forces of the allies were withdrawn in the summer and autumn of 1856. Though the allies did not obtain any decided success, Russia suffered immense loss of military prestige, and any further aggression on her part in S. Europe was for a time prevented. By the peace of Paris (1856) Russia lost the right of navigation on the Danube, besides a strip of territory to the N. of that river, and, also, the unrestricted navigation of the Black Sea. In November, 1870, Russia, availing herself of the Franco-Prussian imbroglio, demanded and obtained from the Western Powers a revision of the treaty of Paris, in so far as it affected the restrictions placed on her in the Black Sea. Sebastopol is now a well-known watering place and one of Russia's greatest naval headquarters. Pop. (1908) 53,595.

Sebesten, or **Sebestan,** in the plural in botany, the nuts of *Cordia myxa* and *C. latifolia*, believed to be the Persea of Dioscorides, and the trees themselves. The nuts are sweet, and when cut have a heavy smell. They are eaten in India. Sebestens are very mucilaginous, and the mucilage is given in diseases of the chest and urethra and as an astringent gargle; the kernel is considered good for ringworm, and the bark a mild tonic.

Sebillot, Paul, a French folklorist; born in Matignon, Côtes-du-Nord, Feb. 6, 1843. After his studies at the communal college of Dinan, and a course of law at Rennes, he went to Paris to become a notary, but soon abandoned the pen for the pencil. The pursuit of his art carried him to Saint-Brieuc and Pont-Aven and many an out-of-the-way corner of Brittany, and opened up to him stores of old-world lore in which he was to find the main interest of his life. From 1870 to 1883 he exhibited in the Salon as many as 20 pictures, but he gradually abandoned art for folklore, and made his name widely known by a series of admirable books. He succeeded to Henri Martin's seat in the Commission for Megalithic Monuments, became *chef du cabinet* at the ministry of public works, and was nominated Chevalier of the Legion of Honor in July, 1889. He edited the "Review of Popular Traditions" from its foundation (1885), and acted as general secretary to the Congrès International des Traditions Populaires at Paris in 1889.

Secamone, in botany, the typical genus of *Secamoneæ*. Erect or climbing smooth shrubs, with opposite leaves, a cymose inflorescence and small flowers, with a five leaved stamineous crown and 20 pollen masses. The root of *S. emetica*, a climbing shrub common in India, acts as an emetic.

Secant, in geometry, a straight line cutting a curve in two or more points. If a secant line be revolved about one of its points of secancy till the other point of secancy coincides with it, the secant becomes a tangent. If it be still further revolved, it again becomes a secant on the other side; hence, a tangent to a curve, at any point, is a limit of all secants through that point. A secant plane is one which intersects a surface or solid. In trigonometry, a straight line drawn from the center of a circle through the second extremity of an arc, and terminating in a tangent to the first extremity of the arc.

Secchi, Angelo, an Italian astronomer; born in Reggio, Italy, July 29, 1818, and trained as a Jesuit. In 1848 he became Professor of Physics at Georgetown College, Washington, and in 1850 at the Collegio Romano, Italy, and director of the Roman observatory, where he labored till his death. His chief discoveries were in the region of spectrum analysis and solar physics; and, besides some 300 papers, he published in French "The Sun" (1870), and in Italian "The Unit of Physical Force" (1869), and "The Stars" (1877). He died in Rome, Feb. 26, 1878.

Secesh, in the United States, a cant term for a Secessionist, of which it is an abbreviation.

Secession. Whenever a State has claimed the right to withdraw from the Union, it has based its claim on the doctrine of State sovereignty. This claim must be considered as emphatically distinct from the right of revolution, insurrection, or violent revolts, in all of which there is no claim of legal right, and the appeal of which is to force instead of to reason. In its turn, nearly every State in the Union has advanced the right of secession, and usually each has been condemned by the others as

treasonable. This claim was specifically brought forward or involved in the Kentucky "Resolutions," the Hartford "Convention," and the "Nullification Ordinance." In the discussion preceding the annexation of Texas there were arguments that led to threats of secession in the South if the refusal to annex should be passed, and in the North if permission to annex should be granted. This demonstrates that before these cases materialized, the doctrine of State sovereignty had been understood, both in the North and South. Among the Southern States there had been some talk of cooperation for the purpose of effecting a secession programme, for no State would have made the attempt independently, but such discussion had resulted in nothing. Nevertheless, State sovereignty and slavery had been bound up together since about 1835, and the logical consequence was secession. Though no such issue had actually been instituted, the feeling between non-slave-holding sections and slave-holding sections, and between the North and South, had become more and more strained. The election of Abraham Lincoln, when the political situation was flanked with sectional differences resting on State claims, was all that was necessary to change the theory of secession in the South into an attempt to effect the reality. South Carolina took the lead by issuing a circular to all the Southern States, in which she declared her readiness to unite with any other State in the act of secession, or to secede alone, provided any other State would agree to follow. No single State was prepared or willing to secede alone, but Florida, Mississippi and Alabama agreed to secede with any other State. Again South Carolina was leader in calling a State convention, and on Dec. 20, 1860, the Act of 1788, ratifying the National Constitution, was repealed, and it was declared "that the union now subsisting between South Carolina and other States, under the name of the United States of America, is hereby dissolved." A declaration of the causes for this act was formulated, and on the 24th was adopted. The governor proclaimed "the secession of South Carolina," the same day. Mississippi was the first to follow this example, Jan. 9, 1861, then in succession came Florida, Jan. 10; Alabama, Jan. 11; Georgia, Jan. 19; Louisiana, Jan. 26; and Texas, Feb. 1, though in the case of this last State the proceedings were decidedly irregular. Virginia followed in April; Arkansas and North Carolina in May; and Tennessee in June. The Civil War was the consequence.

The final issue was the victory of the government, the surrender of the Confederate to the Federal Army, and the full union of the United States of America. See CONFEDERATE STATES.

Secession Church, in Scotch ecclesiastical history, a religious body which broke off from the Established Church of Scotland in 1733. In 1730 the General Assembly had put an end to the practice of recording the protests occasionally taken by individual members against the decision of the church courts. In 1731 the operation of patronage having led to the settlement of an unpopular presentee in the Church of Kinross, the presbytery of Dunfermline hesitated to induct him, and his settlement had to be carried out by what was stigmatized as a "riding committee." Next year the Rev. Ebenezer Erskine, one of the 12 ministers who had taken the evangelical side in the Marrow controversy, preached strongly against the action of the Assembly, in which the Moderates were then dominant. The Synod rebuking him, he appealed to the Assembly, which decided that he should be admonished. He and three other ministers protested, for which they were first suspended and then loosed from their charges. They at once gave in their "secession" from the prevailing party in the Church, whence arose the name, "the Secession." On Dec. 6, 1733, they constituted themselves into an Associated Presbytery. Four more joined in 1737, and a first "Act and Testimony" was published. In 1747 an ensnaring burgess oath divided them into Burghers and Antiburghers. In 1806 the voluntary question (see VOLUNTARYISM) led to another schism. In 1820 they were reunited as the Associated Synod, and in 1847, joining with the Relief, constituted the United Presbyterian Church.

Secessionist, in the United States, one who maintains the right of a State included under the Constitution of the United States to withdraw from the Union and set up an independent government; specifically, one who took part or sympathized with the inhabitants of the Southern States in their struggle, commencing in 1861, to break away from union with the Northern States. See SECESSION.

Seckendorf, Friedrich Heinrich, Count von, a German military officer; born in Königsberg, Germany, July 5, 1673. After studying law at Jena, Leipsic, and Leyden, he adopted the military profession and served against the Turks under Prince Eugene and in the war of the Spanish Succession. On the death of Prince Eugene, 1736, he became Commander-in-Chief of the Austrian army against the Turks, but being unsuccessful, was recalled, tried by court-martial, and imprisoned in the fortress of Gratz, from which he was liberated in 1740. He then took service with the Elector of Bavaria, who had just been elected as Charles VII., Emperor of Germany, and as commander of the Bavarian forces relieved Munich and drove back the Austrians into

Bohemia. On the emperor's death in 1745 he himself set negotiations on foot for establishing a peace; whereupon he was re-established by the new Emperor Francis I., husband of Maria Theresa, in all the honors he had at an early period obtained. He died in Meuselwitz, Germany, Nov. 23, 1763.

Secker, Thomas, Archbishop of Canterbury; born in Sibthorpe, Nottinghamshire, in 1693; son of a Dissenter of independent means, who wished him to enter the ministry of his own communion. In 1716, however, the son turned to medicine, which he studied at London and Paris, ultimately taking his doctorate in physic at Leyden in 1721. Meanwhile, urged by his old schoolfellow, Joseph Butler, he had decided to take Anglican orders; in 1722 he graduated B. A. at Oxford, and in that and the following year he was ordained deacon and priest. His preferments were Houghton-le-Spring (1724), Ryton and a prebend at Durham (1727), chaplain to the king (1732), St. James's, London (1733), Bishop of Bristol (1735), of Oxford (1737), Dean of St. Paul's, for which he resigned the living of St. James's (1750), and the primacy (1758). He was a wise, kindly, hard-working bishop, and a notable preacher in his day. He died Aug. 3, 1768.

Second, the 60th part of a minute of time or of a minute of a degree. The hour and degree are each divided into 60 minutes (marked thus, 60′), and each minute is subdivided into 60 seconds (marked thus, 60″). In old treaties minutes are designated as *minutæ primæ*, or first small divisions, and seconds as *minutæ secundæ* (whence the name) or second small divisions. In music, the interval of a second is the difference between any sound and the next nearest sound above or below it. There are three kinds — the minor second or semitone, the major second, and the extreme sharp second. Also a lower part added to a melody when arranged for two voices or instruments.

Second Adventists, a religious organization having six slightly differing branches in the United States. They are Protestants and their belief is characterized by faith that at some time in the future there will be a visible reappearance of Christ. They do not agree among themselves whether this "divine return" will be visible to all the Church, or to the whole world, or to certain elect "first fruits" of the Church. The original Adventists were called Millerites, and were followers of William Miller from 1781 till 1849. Miller promulgated a belief that the world would end and the millennium would begin in October, 1843. Many people had such implicit faith in his prophecy that they did not "plant or reap" crops, neglected their business, and spent months of time before the appointed hour in religious exercises so as to be in readiness to ascend to heaven. When Miller's prediction proved a failure, some of his followers lost faith in the doctrine, while others decided that an error in calculation had been made. Other predictions have been made since that time, and other dates have been set for the "end of the world." Disappointment, however, has not materially lessened the number of Adventists, since from 50,000 in 1843 they increased to 60,000 in 1890, and in 1900 attained a following of over 125,000. All sects of Adventists are congregational in Church government. Their evangelical views are based on general religious questions. They are very orthodox and strict to an extreme in their mode of living. Many kinds of amusements are prohibted. Intoxicants and tobacco are strongly condemned, though not radically forbidden. The denominations are: (1) Evangelical Adventists, a small sect that holds itself as the original organization of 1845. In their belief is a form of purgatory and eternal punishment. (2) The Seventh-day Adventists, a sect that includes about half of all the Adventists, and which also dates from 1845. Their characteristic is a belief in the future reappearance of Christ, without any specified time for the divine "return." (3) The Church of God, a small body which withdrew from the Seventh-day Adventists in 1866. (4) The Life and Advent Union, a small branch which began in 1848 and completed its organization in 1864. (5) The Churches of God ("Age-to-Come Adventists"), in the United States and Canada, dating from 1851. (6) The Advent Christians, a sect that is second to the Seventh-day Adventists in number, and wide-spread in the United States and Canada. See ADVENTISTS.

Secondary Rocks, in geology, an extensive series of stratified rocks, having certain characters in common distinguishing them from the primary rocks beneath, and the Tertiary above them. Lyell divides the secondary rocks into the Trias, the Oölite, and the Cretaceous; Seeley into the Trias, the Lias, the Pelolithic, the Psammolithic, and the Cretaceous; and Etheridge into the Triassic, the Jurassic, and the Cretaceous.. In many places the palæozoic strata had been fractured, contorted, and even thrown into a vertical position before the secondary rocks began to be deposited. There is a break between the end of the primary rocks and the commencement of the secondary strata. Though most of the latter seem conformable to each other, yet the considerable alterations ever and anon occurring in the character of the fossil remains suggest the existence of breaks not stratigraphically visible. Thus there is no visible unconformability in the Lias, yet only 5 per cent. of the fossils pass from

the Middle to the Upper Lias. During the deposition of the secondary rocks the geographical features of the Northern Hemisphere were again and again modified. From the Lias to the Chalk there seems to have been a series of large tropical islands, drained by considerable rivers, with a vegetation of cycads, reeds, and conifers. Gigantic reptiles were the dominant vertebrates. A great break occurs between the Secondary and the Tertiary. Murchison says that gold is generally absent from Secondary rocks. See PRIMARY ROCKS.

Secondary Schools, educational institutions in the United States higher in grade than the COMMON SCHOOLS (*q. v.*) and next below the grade of colleges. Under this head are classed all public high schools, academies, etc. Under special secondary schools are included all preparatory, normal and manual training schools. The increase and development of public secondary schools has been very rapid. In 1890 there were 2,526 schools with 202,963 students; while in 1900 there were 6,005 schools with 519,251 students. In the matter of studies the increase has been remarkable. The statistics of students in the various studies is as follows:

	1889-1890. Per cent. of total students.	1899-1900. Per cent. of total students.
Latin	34.69	50.61
Greek	3.05	2.85
French	5.84	7.78
German	10.51	14.33
Algebra	45.40	56.29
Geometry	21.33	27.39
Physics	22.21	19.04
General history	27.31	38.16

See COMMON SCHOOLS: EDUCATION: NORMAL SCHOOLS.

Second Rome, Aquiljar, a town of Austria. In the time of the Romans it was entrepôt and commercial center of Northern and Western Europe and the Emperor Augustus often resided there. It was taken and burned by Attila, at which time its population was reckoned at 100,000.

Second Sight, a gift of prophetic vision, long supposed in the Scotch Highlands and elsewhere to belong to particular persons. The most common form it took was to see the wraith, fetch, or shadowy second self of some person soon to die, often wrapped in a shroud, or attended with some other of the special circumstances of death or burial. Of course the prophetic character may easily enough have been a mere additional assumption, the time of occurrence of distant events being apt to be confused with the time of hearing of them. In the popular mind everywhere the mystery of death and the instinctive human longing to believe in a continuity of conscious spiritual life and sympathy have generated a belief in the probability of an appearance

coinciding with, or soon succeeding, the death of an individual; and from this the step is easy to a belief in the possibility of similar appearances before death, in order to foreshadow or forewarn. For, if the appearance be admitted as a probability, it is not difficult to take a further step and attribute to it the function. For what more natural than to suppose that, just as the affection for a dead friend survives the separation of the grave, so the affections of the disembodied spirit or apparitional ghost-soul should continue to cling to the persons loved on earth, and that he should seek by every possible means to give them forewarnings of things soon to happen? And what agents more natural than those gifted souls that stand between the living and the dead, who have attained clearness of spiritual vision by rising above the bondage of sense through lonely meditation and inner communion with things unseen? Such are the seers to whom the gift of second sight was once attributed in the Highlands; and we find, as was to be expected, that most often they were reputed men of severe and virtuous life, who would gladly have lost their faculty if they could, and indeed were often sorely troubled in their minds as to whether it was not something that had come from the devil and not from God. In Aubrey's account we read of one who besought the presbytery to pray for him that he should be relieved from this burden, and how after special supplication and confession it was taken from him. Among the Covenanters too the gift of special foresight and prophecy was one vouchsafed to men like Peden, eminent for holiness and spiritual elevation. The gift seems not to have descended by succession, though this is stated to have been the case in Skye before the Gospel reached it, and there was long a persistent belief that it belonged to the seventh son of the seventh son; according to some it appears in special cases to have been capable of being communicated from one person to another. Martin in his "Description of the Western Isles of Scotland" (1703) gives a full account of the second sight, with a classification of the special visions usually seen, which is conveniently summarized in the seventh chapter of Defoe's well-known "Life and Adventures" of Duncan Campbell (1680–1730), the deaf and dumb soothsayer, who inherited the faculty from his Lapland mother. With regard to the difficult question of the determination of the time between the sight and the fulfilment, we read here that if an object was seen early in the morning the event would be accomplished a few hours afterward; if at noon, the same day; and if at night, the accomplishment would take place weeks, months, and sometimes years afterwards, according to the time of night the

vision was beheld. The appearance of a shroud was an infallible prognostic of death and the nearness or remoteness of the event was judged by the amount of the body that was covered by the ghastly sheet; if it was not seen above the middle, a delay of a year might be hoped for; but if it ascended high toward the head, the mortal hour was close at hand. The reader will remember the splendid artistic use made of an analogous notion to this by Rossetti in "The King's Tragedy." The vision makes such a lively impression on the seers, continues Martin, that they neither see nor think of anything else except the vision as long as it continues; the eyelids of the seer are rigidly fixed, and the eyes continue staring till the object vanishes. Sir Walter Scott has put the second sight to fine use in "Waverley," "The Legend of Montrose," and elsewhere.

The gradation of symbolical appearances we have mentioned strikes the imagination and gives something like a system to the supernatural phenomena. But if we turn to the cases related we find no such regular order and exactness. The evidence is vague and confused, and the incidents are often of the most trivial character, the revelations, apparently mere subjective hallucinations, commonly made to poor illiterate men predisposed from their conditions of life to melancholy and superstition. Moreover, one standing weakness is that such predictions may force their own fulfillment, and the indefiniteness of the time provides a convenient loophole of escape for the conscience. Again, coincidences really due to pure accident account for much; and still more the invariable leaning of the primitive mind to false analogies and to confound the *post hoc* with the *propter hoc.* The savage and the enthusiast alike think in the same vicious circle; what he believes he therefore sees, and what he sees he therefore believes.

Stories of second sight meet us also in the actual world of history. We find it in the story of Wallace and Bruce; again in the famous vision that Thomas the Rhymer had of the death of Alexander III. at Kinghorn; associated with the tragic fate of James I.; and in the unheeded warning given to Scotch nobles before going to find their fate at Flodden. A Scotch seer is said to have foretold the unhappy career of Charles I., and another the violent death of Villiers, Duke of Buckingham. In 1652 Sir George Mackenzie, afterward Lord Tarbat, wrote a minute account of its manifestations, addressed to the celebrated Robert Boyle, which is published in the correspondence of Samuel Pepys. Aubrey throughout life had strong interest in the superstition and has recorded not a few examples. Next came Martin's copious description, then the Rev. John Fraser's "Authentic Instances" (1707), and in 1763 the ambitious but poor and credulous "Treatise on the Second Sight" by Theophilus Insulanus. A fresh revival of interest in the subject took place after the publication of Dr. Johnson's memorable "Journey to the Hebrides" (1775). Johnson was naturally superstitious, and would willingly have believed in the possibility of messages from the other world. But his love of truth was too strong to be satisfied with the evidence, and he confessed that he never could "advance his curiosity to conviction, but came away at last only willing to believe." On one occasion Boswell tells us he laid down a sound canon for such questions, incapable to be shaken: "We could have no certainty of the truth of supernatural appearances unless something was told us which we could not know by ordinary means, or something done which could not be done by supernatural power; that Pharaoh, in reason and justice, required such evidence from Moses; nay, that our Saviour said: 'If I had not done among them the works which none other man did, they had not had sin.'"

Nothing wiser on this question generally has been written than Mrs. Henry Sidgwick's paper, "On the Evidence for Premonitions," in the "Proceedings of the Society for Psychical Research" for December, 1888. She defines premonitions as predictions, foreshadowings, or warnings of coming events which afford, if believed, a knowledge of the future greater than that which human beings could obtain by exercising their faculties on the facts before them; and her conclusion is that the evidence at present collected does not seem sufficient to warrant a conclusion in favor of these.

Secret, in the Roman Catholic Church, the prayer of the mass which follows immediately after the obligation of the bread and wine, and which is recited by the priest in so low a voice as not to be heard by the people.

Secretary Bird, the *Serpentarius secretarius,* from South Africa, a bird protected by the native and English authorities for the service it renders in destroying venomous serpents, which it kills by blows from its powerful feet and bill, though occasionally the serpent succeeds in inflicting mortal injury on its foe. Layard asserts that though this bird can inflict severe wounds with its feet, the legs are so brittle that they will snap if it is suddenly started into a quick run. The secretary bird stands about four feet high; upper surface grayish-blue, shaded with reddish-brown on wing coverts; throat white, thighs black, tail feathers very long, black at base paling into gray, tipped with white; two long central feathers bluish-gray tipped with black and

white. Crest of 10 feathers black or gray tipped with black, arranged in pairs, and erectile at will. From the fancied resem-

THE SECRETARY BIRD.

blance of this crest to a pen behind a clerk's ear, the bird derived its specific Latin and popular English name.

Secretion, in physiology, the process by which materials are separated from the blood, and from the organs in which they are formed, for the purpose either of serving some ulterior office in the animal economy, or being discharged from the body as excrement. Secretion is one of the natural functions of the living body, and is as necessary to health as nutrition. Where the secreted materials have some ulterior purpose to serve, they are known as secretions; where they are discharged from the body, excretions. Most of the secretions seem to consist of substances not preëxisting in the same form in the blood, but requiring special organs and process of elaboration for their formation. Excretions, on the other hand, commonly or chiefly consist of substances existing ready formed in the blood, and are merely extracted therefrom. In general, however, the structure of the parts engaged in eliminating excretions is as complex as that of the parts concerned in the formation of secretions. The secretions may be arranged into three sorts: (1) exhalations; (2) follicular secretion; and (3) glandular secretion. The exhalations take place as well within the body as at the skin or in the mucous membranes, and are thus divided into external and internal. The follicles are divided into mucous and cutaneous, and into simple and compound. In almost all the points of the skin little openings exist which are the orifices of small hollow organs with membranous sides, generally filled with an albuminous and fatty matter. The consistence, color, odor, etc., are variable, according to the different parts of the body, and the matter is continually spread upon the surface of the skin, rendering it less impervious to moisture, etc. The small organs are called the follicles of the skin. The glands, however, are the principal organs to which the office of secreting is more especially ascribed, and the number of them is considerable. The glandular secretions are of seven different sorts, namely, tears, saliva, bile, pancreatic fluid, urine, semen, and milk.

In botany, in consequence of the action of air and light on the watery contents of the green leaves of plants, the materials within them are subjected to a very active chemical condition, by which various substances are formed,—as protein matters, gum, sugar, starch, etc., all of which are essentially necessary to the growth of the plant. Besides these are other matters, such as coloring substances, numerous acids, various alkaloids, etc., which, after their production, perform no further active part in the plant, and are hence removed from the young and vitally active parts to be stored up in the older tissues of the plants as secretions, or removed altogether from them as excretions.

Secret Service, United States, a bureau connected with the Treasury Department, whose chief and almost sole object is to guard against the counterfeiting of the money of the United States and the detection and punishment of the counterfeiters. It is presided over by a chief, who has under him a number of skillful detectives, who are stationed in various parts of the country or assigned to special fields of operation on occasions of emergency. Regarding the necessity for and the danger involved in the work, John E. Wilkie, chief of the bureau, in a publication, under date of July 29, 1899, said: "Certainty of swift detection should perhaps prevent counterfeiting, but so long as there is a gambler's chance of escape there will be found those who feel sure they can succeed where others have failed. Hence the necessity for the secret service branch of the government. And as the making of spurious money is a fascinating enterprise for a cunning rogue, so the checkmating of that same rascal in the countless schemes devised to yield an illegitimate fortune is a game of absorbing interest to him who plays it. The liberty of one, perhaps the life of one or the other, are the stakes in this battle royal.

"The advantage lies first with the lawbreaker. He plans and works in secret for months and sometimes years; then stealthily, through trusted channels, the product

of his labor is marketed and bad money is quickly turned into good. But work as he may some imperfection in his spurious bills which has escaped him one day arrests the glance of the keen eyed money handler. Familiarity with the characteristics of genuine money results in the involuntary detection of a counterfeit. Something about the bill is 'off.' One may not be able to determine in just what respect it fails to equal the genuine, and sends it to Washington for inspection. There a line for line comparison with the genuine establishes the spurious character of the suspected note; circulars giving its description and pointing out its imperfections are sent broadcast to bankers and money handlers. The public thus placed on its guard is wary, and it is no longer safe for the gang to continue the circulation of this particular note. Changes must be made in the plate to disguise its character or a new plate prepared. Meantime everything is 'off,' and the passers lay low while the maker goes to work again. The counterfeiters have made the first move in the game, which is now 'up to' the Secret Service.

"I might go on and detail the operations of the service in the work of discovering the maker of a good counterfeit, but it would hardly be wise to do so. No two cases are ever exactly alike, for your counterfeiter is a fertile fellow, and is a constant student and inventor of precautionary measures that he feels certain will insure his safety. In the investigations made by the division, the chief has constantly before him the exhaustive daily reports of each man in the service, and a careful weighing of the various points submitted by operatives working often at widely separated localities will frequently suggest a move in the right direction. The gravity of the crime makes progress slow, for no step is taken till facts are established to warrant it. It is always considered desirable to so arrange the final act in this drama that the criminal may be taken wholly by surprise. There is a sort of momentary paralysis following the shock of sudden disaster, and when a raid is properly planned the chances of serious resistance are minimized.

"Occasionally it happens that it becomes necessary for a deal to be made directly with the handlers of spurious money, and in these cases it takes a man of nerve and keen wit to bring it to a successful issue. Such transactions are always fraught with great personal danger."

Secret Societies, organizations that in some form or other have existed in all ages of the world's history. In the ancient world many of the more influential religions had their mysteries, the ceremonies connected with which were generally performed

Secret Societies

in secret and only in the presence of those who had been duly initiated. These inner and more secret groups of priests and initiated worshipers existed in association with the worship of Mithras in Persia, of Orpheus and Dionysus in Greece, at Eleusis and elsewhere, or Osiris and Serapis in Egypt, and of the Great Mother (Cybele) in Phrygia. The followers of Pythagoras formed what was in many respects a secret religious society, though philosophy and political doctrine took a foremost place in their teachings. The Druids are often represented as practising secret rites, handed down through certain of the priests; but upon this matter the evidence is shadowy in the extreme. Among the Jews there proceeded from out of the Pharisees the puritanical Essenes (Chasidim), who for the purpose of living a holier life formed themselves into what were virtually religious clubs, characterized by many features common to exclusive religious societies. The Essenes were the forerunners of the Jewish Cabbalists, who professed a secret system of theology and philosophy associated with mystic practices, and of Christian Gnostics, who formed exclusive sects based on initiation and esoteric teaching. The lineal successors of these last were the various mediæval sects of CATHARI (*q. v.*), most of whom invested their teaching and their worship with many features of mystery. In the Roman Catholic Church the office of the Inquisition deserves to be called a secret society, and so does the order of the Jesuits, especially in respect to its methods; though in both cases the secrecy was due to political rather than to strictly religious causes. The Knights Templar toward the close of their history as a distinct order seem in several cases to have lapsed into the practice of secret rites and belief in certain secret doctrines. The Druses hold a peculiar place as the inheritors of a national religion which is jealously exclusive both in doctrine and ritual.

The Freemasons and the Odd Fellows are perhaps the best known of the secret societies in the United States that have cultivated social aims. The Rosicrucians had their origin in the 17th century, and directed their attention to the discovery of such things as the philosopher's stone and the elixir of life, to the exorcism of spirits, and such like pursuits. Speculative Freemasonry does not go further back than the 18th century; its objects are philanthropic and moral. There are associations similar in character to it in Tahiti and others of the Pacific Islands, and among the Foulah and the Negroes of Sierra Leone and the adjacent parts of Africa. The celebrated "Vehmgerichte" or secret courts of Westphalia arose in a time of great public confusion, and made it their business to main-

tain that order and respect for the law which it should have been the concern of the emperor and his associates to have secured and preserved. There existed in Sicily from the 12th to the 18th century an organization (the Beati Paoli) very similar to the "Vehmgerichte." On the other hand, there have been numerous associations of a secret kind formed for criminal purposes, and for mutual assistance against and in defiance of the laws of the land; the Assassins in Persia and Syria, the Thugs in India, the Camorra, the Mafia, and the Decisi (1815) in Italy, the Chauffeurs in France (who arose during the religious wars and were not suppressed till the Revolution), and the Garduna in Spain (formed after the wars against the Moors; suppressed in 1822) may be instanced.

The Illuminati, the authors of a movement that grew up in Germany in the end of the 18th century, united political and religious ends, and may be said, summarily, to have aimed at realizing the ideals of the French Revolution. The following century was wonderfully prolific in political secret societies. Italy was literally honeycombed with them during the years she was struggling for her independence; the best known was that of the Carbonari. At the same time there were similar societies, with similar revolutionary or democratic or constitutional aims, in other countries of Europe, as the Burschenschaft and Landsmannschaft societies in Germany, the Associated Patriots in France, the Communeros in Spain, the Hetairia in Greece, the Society of United Slavonians and the Decabrists in Russia, the Polish Templars, and the associations known as Young Germany, Young Italy, Young Poland, Young Switzerland. The German Tugendbund was hardly a secret society in the proper sense of the term. Nearly all the political revolutions that took place in France during the course of the 19th century were greatly fomented by secret societies, especially the revolution of 1848. Here too should be mentioned the Omaladina, a movement having for its headquarters Servia and Belgrade, and for its objects the establishment of a republican pan-slavic confederation. The most momentous movements of a socio-political tendency that have sprung up on the Continent, and spread to some extent to England, are those of the Nihilists, the Anarchists, and various sects of extreme Socialists.

There are perhaps no people in the world who favor secret societies more than the Chinese and the inhabitants of the United States. But while the objects of these associations in the former country are mostly political, in the latter they are predominantly social. The most powerful organization of this nature in China — indeed its ramifications extend to all parts of the world where Chinamen are allowed to settle — is the Tien-ti Hwuy (Union of Heaven and Earth), which presents many features analogous to Freemasonry, such as secret signs, solemn initiation ceremonies, peculiar observances, and so forth; but its principal object seems to be the overthrow of the existing Manchu dynasty and the restoration of the last Chinese dynasty of the Ming. The White Lily is very wealthy and very strict in its rules, and its members are popularly accredited with the possession of magical powers. But about the real purposes of this, as of most other secret societies that exist among the Chinese, our information is exceedingly scanty. The Society of the Elder Brethren, which is, generally speaking, a combination of the most lawless elements of the population in the central provinces (Honan to Hunan), proclaims a fanatical hatred to all foreigners, including the Manchus. (See Boxers.) Secret societies of all kinds, and for nearly all conceivable purposes, are found in the United States, from the Vigilance Committee, formed in the Western States for the preservation of public order, to the associations in the colleges and universities.

Section, a distinct part or portion of a book or writing; a division or sub-division of a chapter; a paragraph; a division of a statute or other writing. Hence often applied to the sign §, used to denote such a division or sub-division. Also a distinct part or portion of a country, people, community, class, or the like; a class, a division. In that portion of the United States once general government land and surveyed by order of the National authorities, one of the portions of a square of 640 acres, or one square mile each, into which the public lands are divided. Each section is $\frac{1}{36}$ of a township. The sections in each township are numbered. Sections are sub-divided into half-sections, quarter-sections, and even into eighths of a section. In preëmpting a homestead a settler may claim a quarter section.

In architecture, a vertical plan of the interior of a building, of a piece of country, of a mine, or of any structure, natural or artificial, showing it as it would appear upon an upright plane cutting through it. In buildings, sections show the thicknesses of the walls, ceilings, floors, the heights of rooms and of doors and windows, and the forms of the ceilings, whether flat, coved or vaulted. Sections are longitudinal, transverse, vertical, horizontal, oblique, central, lateral, etc., according to position and direction. In geology, the representation of an imaginary cutting, generally vertical, through a certain number of beds. Sections are so essential to a right comprehension of the dip, the strike, and the mutual

relations of strata, that they abound in geological books. In machinery, a detachable portion of a machine or instrument when made up of a number of parts. In microscopy, a thin slice of any organic or inorganic substance cut off for microscopic examination. Sections are named according to the direction in which they are taken, as longitudinal, transverse, etc. They are also described specifically, as anatomical, or mineralogical sections. In music, a part of a movement, consisting of one or more phrases. In surveying, a view showing the inequalities of the ground in reference to a base line or line of construction.

Sectio-planography, a method of laying down the sections of engineering, as railways, etc. It is prepared by using the line of direction laid down on the plan as a datum line, the cuttings being plotted on the upper part and the embankments on the lower part of the line.

Sector, in geometry, that portion of the area of a circle included between two radii and an arc. The area of a sector is equal to the product of the arc of the sector by half of the radius. If the angle at the center is given, the length of the arc of the sector may be found, since it is equal to x multiplied by the radius into the ratio of 180° to the number of degrees of the sector. A spherical sector or the sector of a sphere is a volume or solid that may be generated by revolving a sector of a circle about a straight line drawn through the vertex of the sector as an axis, or it is the conic solid whose vertex coincides with the center of the sphere, and whose base is a segment of the same sphere. In mathematics and surveying, a mathematical instrument used for laying down plans, measuring angles, etc. It has two legs, united by a rule-joint, and graduated. The scales put on sectors are divided into single and double; the former has a line with inches divided into eighths or tenths; a second, into decimals containing 100 parts; a third, into chords; the fourth has sines; the fifth, tangents; the sixth, rhombs; the seventh and eighth have latitudes, hours, etc. The double scale contains a line of lines; second a line of chords; third, a line of sines; fourth, tangents to 45°; fifth, secants; sixth, tangents above 45°; seventh, polygons. In surveying, the instrument is mounted on a leg or tripod, and the bob depending from the axis of the rule-joint indicates the station exactly. For sector in astronomy, see DIP-SECTOR: ZENITH-SECTOR.

Secular, occurring or observed once in an age, century, or cycle; as a secular year. Also pertaining or relating to an age, generation, or period of time; as secular inequality. Or pertaining or having reference to this present world, or to things not spiritual or holy; relating to things not primarily or immediately affecting the soul; worldly; temporal; as, secular power, secular affairs. In the Roman Catholic Church, not regular, not bound by monastic vows or rules; not confined to a religious house or subject to the rules of a clerical community; as, a secular priest; an ecclesiastic not bound by monastic rules; hence a layman.

Secular Games, a great festival, probably of Etruscan origin, anciently celebrated at Rome to mark the commencement of a new *sæculum* or generation. In 294 B. C. it was decreed that the secular games should be celebrated every hundredth year after that date; but this decree was frequently disregarded, and they were celebrated at very irregular intervals.

Secularism, the name given, about 1846, by George J. Holyoake to an ethical system founded on natural morality.

"Secularism is that which seeks the development of the physical, moral, and intellectual nature of man to the highest possible point, as the immediate duty of life — which inculcates the practical sufficiency of natural morality apart from Atheism, Theism, or the Bible — which selects as its method of procedure the promotion of human improvement by material means, and proposes these positive agreements as the common bond of union, to all who would regulate life by reason and ennoble it by service."

Secularism claims for its adherents four distinct rights:

(1) The right to think for one's self, which most Christians now admit, at least in theory.
(2) The right to differ, without which the right to think is nothing worth.
(3) The right to assert difference of opinion, without which the right to differ is of no practical use.
(4) The right to debate all vital opinion, without which there is no intellectual equality — no defense against the errors of the State or the pulpit.

Secularization, the act of secularizing; the act of rendering secular; the state of being rendered secular; the act of converting from religious or sacred to secular or lay possession, use, or purpose; as, the secularization of church property.

Secundus, Johannes, a Dutch poet; born in The Hague, in November, 1511. His best-known work is "Kisses" (1539), consisting of amatory poems. His "Poetical Works" were published by his brother in 1541. He died in Utrecht, probably in 1536.

Secundus, Publius Pomponius, a Roman poet who lived in the 1st century of our era. Tacitus speaks of his tragedies in the highest terms, as does also Quintilian. The elder Pliny wrote his "Life" in two books.

Sedaine, Michel Jean (sed-ān'), a French playwright; born in Paris, July 4, 1719. He is regarded as the originator of comic opera. Among his works are the comic operas: "Playing the Deuce"; "The King and the Farmer"; "Richard Cœur de

Lion"; "Aline, Queen of Golconda." His comedies "The Philosopher without Knowing It" (1765) and "The Unexpected Wager" (1768) won for him membership in the Academy; they have still a place in the repertoire of French theaters. He died in Paris, May 17, 1797.

Sedalia, a city and county-seat of Peltis co., Mo.; on the Sedalia, Warsaw, and Southwestern, the Missouri Pacific, and the Missouri, Kansas, and Texas railroads; 95 miles E. of Kansas City. Here are the George R. Smith College, Convent of St. Joseph, Sacred Heart School, United States government building, the Kansas City and Missouri, and Texas Railroad Hospitals, street railroad and electric light plants, National and State banks, and daily, weekly, and monthly periodicals. The city has besides large locomotive and car shops, flouring mills, grain elevators, iron foundries, manufactories of farming implements, etc., and an assessed property valuation of nearly $4,500,000. During most of the Civil War the city was a United States military post. Pop. (1890) 14,068; (1900) 15,231; (1910) 17,822.

Sedan, a fortified town of France, department of Ardennes, on the Meuse, 10 miles E. S. E. of Mezières. Sedan has been long celebrated for its woolen manufactures, consisting principally of fine black cloths and cassimeres. Here, Sept. 1–2, 1870, a battle was fought between the French, under Napoleon III., and the Prussians, under King William and the crown prince, in which the former being defeated, the emperor, while still at the head of an army of more than 100,000 men, surrendered himself and his troops, along with the strong and well-appointed fortress of Sedan to the Prussians. On the occasion of this act, happily unparalleled in modern history, the French people stigmatized Napoleon III. by this parody of the famous and noble words of Francis I.: "Nothing lost but honor!" Pop. (1901) 19,349.

Sedan Chair, a portable covered vehicle for carrying a single person, borne on two poles by two men. The name is derived from the town of Sedan, where this species of conveyance is said to have been invented. The Duke of Buckingham used one in the reign of James I., a proceeding which gave general offense, it being made matter of public remark that this loyal favorite used his fellow-countryman to do the work of beasts. In September, 1634, Sir Sanders Duncombe got a letter patent, granting him the sole right and privilege for 14 years to use and let for hire within London and Westminster "covered chairs" to prevent the unnecessary use of coaches; according to Evelyn he got the notion from Naples. Sedan chairs were largely used during the greater part of the 18th century, being found very well adapted for transporting persons in full dress to public and private entertainments. Not only were there numerous public conveyances of this kind in London and all considerable towns, but the owner of every large mansion had his private sedan handsomely fitted up. In Edinburgh at the close of the 18th century sedan chairs were far more numerous than hackney coaches, and were almost all in the hands of Highlanders. Sedan chairs have also been employed as ambulances for conveying sick persons to hospitals.

Sedative, in medicine, a remedy which allays irritability and irritation, and which assuages pain. Sedatives are divided, according to the parts on which they act, into external or local (as hydrocyanic acid, belladonna, and opium), spinal (hemlock, bromide of potassium), stomachic (dilute hydrocyanic acid and nitrate of silver), and vascular (ammonia, alcohol).

Sedge (*Carex;* natural order, *Cyperaceæ*), an extensive genus of grass-like plants containing thousands of species, mostly inhabiting the N. and temperate parts of the globe. The greater proportion of the species are marsh plants. The stems are usually triangular, without joints. The sedges in general are of but little utility to man. They furnish coarse fodder, which is rejected by most of the domestic quadrupeds. The decomposed roots and leaves contribute largely to turn the soil of marshes into peat.

Sedgemoor, a marshy tract in Somersetshire, England, about 5 miles S. E. of Bridgwater. In 1685 it was the scene of the battle in which the Duke of Monmouth was defeated by the troops of James II.

Sedge Warbler, the *Acrocephalus schœnobœnus,* a small European singing bird. Its total length is rather less than five inches; tail comparatively short; upper surface rufous-brown, clouded with a darker shade; breast, belly, and lower tail coverts pale buff. The eggs are five or six in number, pale yellowish-brown, generally clouded with a darker shade, and the young are hatched about the end of May.

Sedgwick, Adam, an English geologist; born in Dent, Yorkshire, England, in 1785. He was educated at Sedberg and at Cambridge University and in 1818 was appointed Woodwardian Professor of Geology in the latter; this chair he held till within a short time of his death. His chief services to geology consisted in the determination of the geological relations of the palæozoic strata of Devon and Cornwall, and of those strata afterward called Permian in the N. E. and N. W. of England, in the explanation of the geological character of North Wales, and not less in the enlargement of the geological

museum at Cambridge. The only considerable work of Professor Sedgwick's is a "Discourse on the Studies of the University of Cambridge," which had a wide circulation. He died in Trinity College, Cambridge, Jan. 27, 1873.

Sedgwick, Catherine Maria, an American novelist; born in Stockbridge, Mass., Dec. 28, 1789. She wrote: "A New England Tale" (1822); "Redwood" (1824); "The Traveler" (1825); "Hope Leslie; or, Early Times in Massachusetts" (1827); "The Linwoods; or, Sixty Years Since in America" (1835); "The Poor Rich Man and the Rich Poor Man" (1836); "Letters from Abroad" (1841); "Historical Sketches of the Old Painters" (1841); "Morals of Manners" (1846); "Married or Single" (1857). She died near Roxbury, Mass., July 31, 1867.

Sedgwick, John, an American military officer; born in Cornwall, Conn., Sept. 13, 1813. He was graduated at the United States Military Academy in 1837; served in the Mexican and Seminole War as 1st lieutenant (1846–1847); was a lieutenant-colonel in the regular army when the Civil War began; served in the Army of the Potomac as commander of brigade and division till February, 1863, when he was placed in command of the 6th Army Corps. He distinguished himself at Fair Oaks, May 31, and June 1, 1862; took part in the Seven Days' battles, June 25 to July 1; and having displayed great bravery and skill at Antietam, Sept. 16 and 17, was promoted to Major-General in December. He was severely wounded at Antietam; took a leading part in the battles of Chancellorsville, Gettysburg, and the Wilderness; and was killed at the battle of Spottsylvania, May 9, 1864.

Sedgwick, William Thompson, an American biologist; born in West Hartford, Conn., Dec. 29, 1855; was graduated at the Sheffield Scientific School of Yale University in 1877; instructor of biology at Johns Hopkins University in 1880–1883; Professor of Biology at the Massachusetts Institute of Technology since 1883. He was joint author of "General Biology" (1886) and assistant editor of "Life and Letters of William Barton Rogers" (1896).

Sedilia, in architecture, originally the rows of seats in a Roman amphitheater. Now applied to the stone seats on the S. side of the altar in Catholic churches; used by the priest, deacon, and sub-deacon in the intervals of the church service. In cathedrals a row of such seats is provided for the clergy, and they are occasionally canopied and enriched with sculpture.

Sedition, a factious rising or commotion in a State, not amounting to insurrection; the stirring up or fomenting of such a commotion; the stirring up or fomenting of discontent against government, and disturbance of public tranquillity, as, by inflammatory speeches or writings; acts or language inciting to a breach of the public peace; excitement of resistance to lawful authority. Sedition comprises such offenses of this class as do not amount to treason, being without the overt acts which are essential to the latter.

Sedley, Sir Charles, an English dramatist; born in Aylesford, Kent, England, in 1639. He is author of the favorite song "Phyllis." He wrote four comedies, among them "The Mulberry Garden" (1668) and two tragedies. He died Aug. 20, 1701.

Sedley, Henry, an American author; born in Boston, Mass., April 4, 1835. Originally a civil engineer, he surveyed and mapped many of the streets of San Francisco, Cal., after doing which he went round the world. He afterward became a journalist, and was at one time one of the editors of the New York "Evening Post," "Times," and "Commercial Advertiser"; was founder and for a time editor of the "Round Table," which was later changed to the "Nation." He published: "Dangerfield's Rest: A Romance" (1864), and "Marion Rooke; or the Quest for Fortune" (1865). He died in New York city, Jan. 18, 1899.

Sedrat, in Mohammedan mythology, the lotus tree, standing on the right-hand side of the invisible throne of Ali, with two rivers running from its roots. Its boughs extend farther than the distance between heaven and earth, numberless birds singing among them, and countless angels resting beneath their shade, and a houri being inclosed in each seed of the fruit. (See Rev. xxii.).

Sedum, the stonecrop or orpine; a genus of *Crassulæ*. Succulent herbs, generally with cymose flowers. Calyx four- to six-lobed; petals four to six, generally five, patent; stamens 8 to 10, usually 10; follicles with many, more rarely with few seeds. Known species 120, chiefly from the North Temperate and Arctic zones, especially in the old world. The most common of the wild species is *S. acre*, which has golden yellow flowers, and is found on rocks, walls, and sandy places near the sea, and even on the thatched roofs of the cottages. It is acrid, rubefacient, emetic, and purgative. *S. ochroleucum*, described by Dioscorides, is a refrigerant; *S. telephium*, a refrigerant and an astringent.

See, a diocese; the seat of episcopal authority; the jurisdiction; as, an episcopal see; the province or jurisdiction of an archbishop; as, an archiepiscopal see; the seat, place, or office of the Pope or Roman pontiff; as, the Papal See; the authority of the Pope or court of Rome; as, he was delegated by the See of Rome.

See, Thomas Jefferson Jackson, an American astronomer; born near Montgomery City, Mo., Feb. 19, 1866; was graduated at the University of Missouri in 1889, and at the University of Berlin in 1892; was in charge of the observatory of the University of Missouri in 1887–1889; had charge of and aided in the organization of the Yerkes Observatory of the University of Chicago in 1893–1896; was astronomer of the Lowell Observatory during the survey of the Southern heavens in 1896–1898; became Professor of Mathematics in the United States Naval Academy in 1899; and in December of that year took charge of the 26-inch equatorial telescope of the United States Naval Observatory. He completed about 45 orbits of double stars; was a Fellow of the Royal Astronomical Society; member of the American Philosophical Society; the American Mathematical Society, the Astronomische Gesellschaft, etc.; and was the author of numerous astronomical papers and books, including "Researches on the Evolution of the Stellar Systems," and "The Evolution of the Double-star Systems."

Seebachite, a mineral originally described as herschelite, but made a new species by Bauer. Crystals like those of herschelite. Composition: A hydrous silicate of alumina, lime, and soda. Found in cavities in basalt at Richmond, near Melbourne, Australia.

Seed, the nature of a fecundated ovule. It consists essentially of the young plant or embryo, inclosed in integuments, of which there are usually two. It varies much in form; thus it may be rounded, as in the water-cress; reniform, as in the poppy; obovate, as in the larkspur; similar terms being employed in describing these forms to those applied to like modifications of other organs. The outer integument, or seed coat, is termed the testa or episperm. It is usually of a brown or somewhat similar hue, as in the almond; but it frequently assumes other colors. It varies in texture, being soft, fleshy, membranous, coriaceous, etc. It is sometimes curiously marked with furrows, ridges, etc., and often furnished with hairs, spines, wings, and other appendages. The inner integument is called the tegmen, or endospleura; it is generally of a soft and delicate nature. A third integument, more or less complete, is occasionally found on the surface of the others. The inner portion of the seed, called the nucleus, or kernel, may either consist of the embryo alone, as in the wallflower and the bean, or of the embryo inclosed in albumen or perisperm, as in the morning-glory. When the nourishing matter, called albumen, is present, the seed is said to be albuminous; when it is absent, to be exalbuminous. The duration of the vitality of seeds is a much discussed question, but scientists discredit the generally received statement that seeds hundreds of years old will germinate; *e. g.*, grains found with Egyptian mummies. Few seeds germinate after three or four years, though some leguminous seeds appear to have lived for 70 years. See ALBUMEN: ARILLUS: EMBRYO: OVARY: PLACENTA.

Seeding, sowing either in drills or broadcast, an operation formerly conducted altogether by hand. Machines are now in use adapted to sowing the finest grass seeds or the most bulky grains and seeds. There is a form of field seeder, which will finish 12 acres a day with the drills exactly equidistant.

Seeley, John Robert, Sir, an English historian; born in London, in 1834; In 1869 he became Professor of Modern History in Cambridge University. He first came into notice through "Ecce Homo" (a life of Christ), in 1865, which made a great sensation and was reviewed by Mr. Gladstone; he published "Natural Religion" in 1882; and in "Lectures and Essays" (1870) he wrote on art, ethics, and education. Among his other works are: "Life and Times of Stein" (3 vols. 1878), a history of the regeneration of Prussia in the Napoleonic period; "The Expansion of England" (1883: a series of lectures), and cognate works; and "A Short History of Napoleon the First" (1886: reprinted from the "Encyclopædia Britannica"). He died in Cambridge, Jan. 13, 1895.

Seeley, Levi, an American educator; born in North Harpersfield, N. Y., Nov. 21, 1847; was graduated at the Albany Normal School in 1871, and later studied in Germany; was principal of various educational institutions till 1895, when he was made Professor of Pedagogy at the Trenton Normal School. His publications include: "The Grube System of Numbers" (1887); "The Grube Idea" (1890); "The German Common School System and Its Lessons to America" (1896); "History of Education" (1899); etc.

Seely, [Edward] Howard, an American author; born in New York city, Oct. 25, 1856. In 1893 he became associate editor of "Peterson's Magazine." He published many volumes, among them: "A Lone Star, Bo-Peep, and Other Stories"; "Texan Ranch Life"; "A Nymph of the West"; "The Jonah of Lucky Valley, and Other Stories"; "A Border Leander." He died in Brooklyn, N. Y., June 23, 1894.

Seelye, Mrs. Elizabeth (Eggleston), an American author, daughter of Edward Eggleston; born in St. Paul, Minn., Dec. 15, 1858. She wrote: "The Story of Columbus"; "Montezuma"; "Brant and Red Jacket"; "Pocahontas"; "Tecumseh"; and "The Story of Washington"; "Lake George in History"; "Saratoga and Lake Champlain in History"; etc.

Seelye, Julius Hawley, an American educator; born in Bethel, Conn., Sept. 14, 1824. He was president of Amherst College (1876–1890), and inaugurated the "Amherst system" of self-government, which was productive of good results. His publications include: "The Way, the Truth, and the Life" (1873), translated into Hindustani, Japanese, and German; "Christian Missions" (1875); and his revised edition of Hickok's "Moral Science" (1880). He died in Amherst, Mass., May 12, 1895.

Seelye, Laurenus Clark, an American educator; born in Bethel, Conn., Sept. 20, 1837; was graduated at Union College in 1857; studied in the Universities of Berlin and Heidelberg; became pastor of the North Congregational Church, Springfield, Mass., in 1863; and Professor of Rhetoric and English Literature in Amherst College in 1864. He was president of Smith College in 1873-1909.

Seemann, Berthold, a German author; born in Hanover, Germany, Feb. 28, 1825. He was naturalist to three exploring expeditions (1846–1851), and wrote: "Voyage of the Herald," and "Three Cruises to Arctic Regions in Search of Sir John Franklin" (1852); "Popular History of Palms" (1855); "Account of Mission to Fiji Islands" (1862); "Popular Nomenclature of the American Flora"; and "Dottings on the Roadside in Panama, Nicaragua and Mosquito." He died in Nicaragua, Oct. 10, 1871.

Seemuller, Mrs. Annie Moncure (Crane), an American novelist; born in Maryland in 1838. Her works were at one time very popular, and include the novels "Emily Chester"; "Reginald Archer"; "Opportunity." She died in 1872.

Seer, a weight in India, formerly varying in different parts of the country, but by an act of the Anglo-Indian government (Oct. 31, 1871), the seer was adopted as the primary standard of weight, and made equivalent to a kilogramme.

Sefatians, a sect of Mohammedans who held that God possessed eternal attributes, and that there was no difference between the "essential attributes" and the "attributes of operation." To these they, in process of time, added a third category, "declarative attributes," by which they understood anthropomorphic expressions, such as God's eyes, His arms, His hands, etc. They were opposed to the Mutazilites. They ultimately split into several sects, some of which still exist.

Segan Fu. See SINGAN FU.

Segantini, Giovanni, an Italian genre painter; born in Arco, Italy, Jan. 15, 1858. His youth was spent largely in pastoral occupations; and he was self-taught in art. After becoming known as an artist, he spent many years in Milan. He was the first painter to make peasant life in the high Alps a special field of work. He died Sept. 20, 1899.

Segar. See CIGAR.

Segesta, in antiquity, a city of Sicily; situated near the coast, 27 miles W. S. W. of Palermo. It was an ally of Athens in the Peloponnesian War, became a dependent of

COIN OF SEGESTA.

Carthage about 400 B. C., and passed under Roman supremacy at the time of the first Punic War. There still remain the ruins of a Greek theater and a Greek temple, the latter being one of the most complete examples extant of Greek architecture. Near the ancient site of Segesta is now the modern town of Catalafimi.

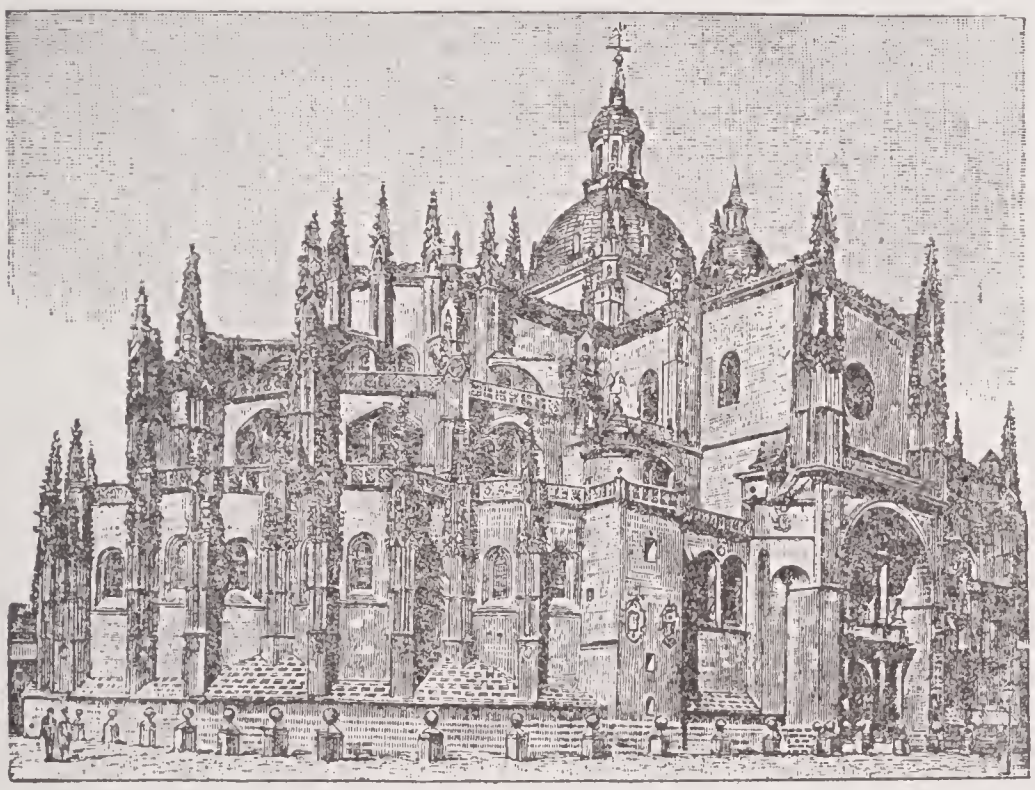
Segment, in comparative anatomy, one of the divisions or rings in the body of an insect, an annelid, a decapod, crustacean, etc. In geometry, a segment is a part cut off from any figure by a line or plane. The segment of a circle is a part of the area of a circle included between a chord and the arc which it subtends. An angle in a segment is the angle contained by any two straight lines drawn from any point in the arc and terminating in the extremities of the chord. Similar segments of circles are those which contain equal angles, or whose arcs contain the same number of degrees. A spherical segment is a portion of a sphere bounded by a secant line and a zone of the surface. If a circular segment be revolved about a radius drawn perpendicular to the chord of the segment, the volume generated is a spherical segment.

Segno (sā'nyo), in music, a sign or mark used in notation in connection with repetition. *Al segno* (to the sign), a direction to return to the sign; *dal segno* (from the sign), a direction to repeat from the sign.

Segovia, an old city of Spain; at the N. foot of the Sierra de Guadarrama; 32 miles N. N. W. of Madrid. It occupies a rocky eminence 3,300 feet above sea-level, is surrounded by ruinous walls with round towers, and consists of narrow uneven streets, with old, quaint, and stately houses, and numerous parish churches and convents. The fortress or castle is perched on the W. extremity of the rocky height, and was originally Moorish, but has been gradually restored since its destruction by fire in 1862;

its towers and windows command magnificent views. The cathedral (1521–1577) is one of the finest specimens of Late Gothic in Spain. The grand aqueduct, built in the time of Trajan, is a very fine example of Roman architectural work. It consists of two rows of arches, the one resting on the other, some 2,600 feet long and 102 feet high. Wool scouring and the manufacture of paper, pottery, and cloth are carried on. Segovia was a place of importance during the time of the Romans, and was frequently the residence of the kings of Castile and Leon. The unresisting town was sacked in 1808 by the French. Pop. 14,389.

Segregation, in geology, that process in nature by which, when a mixed mineral mass has been deposited or accumulated, and left to the influence of the chemical forces



SEGOVIA: CHOIR OF CATHEDRAL.

always operating, certain minerals tend to separate themselves from the mass, and collect into natural cracks or blisters, either previously existing or formed during the operation.

Seguidilla (seg-ĭ-dēl′yä), a Spanish form of versification, consisting of four lines, generally assonant lines, of seven and five syllables alternately. It usually has a close of three verses, called "estribillo," of which the first and last lines rhyme.

Seguin (se-ga*ng′*), **Edouard,** an American physician; born in Clamecy, France, Jan. 20, 1812; studied medicine and surgery, devoted himself specially to the study of idiocy and the training of idiots and the insane. He settled in the United States after the revolution of 1848. In 1873, he was United States commissioner on education to the Vienna Exposition. He invented a physiological thermometer. Among his works are: "Theory and Practice of the Education of Idiots" (1841–1842); "Hygiene and Education" (1843); "Moral Training, Hygiene and Education of Idiots and other Backward Children" (1846); "Sketch of J. R. Pierce" (1847); "New Facts Concerning Idiocy" (1870); "Medical Thermometry" (1871); "Manual of Thermometry for Mothers" (1873); etc. He died in New York city, Oct. 28, 1880.

Ségur, Louis Philippe, Comte de (sā-gür′), a French historian; born in Paris, Dec. 10, 1753. He received a military education; served in America under Rochambeau; later he was appointed ambassador to Russia. During the Reign of Terror he left public life and devoted himself to literary labor. Among his works are: "Théâtre de l'Hermitage" (1798); "Tales, Fables, Songs, and Verses" (1801); "Memoirs, or Souvenirs and Anecdotes" (1825). He died in Paris, Aug. 27, 1830.

Ségur, Philippe Paul, Comte de, a French historian, son of L. P.; born in Paris, Nov. 4, 1780. He wrote: "History of Nanoleon and the Grand Army in 1812" (2 vols. 1824); "History of Russia and Peter the Great" (2 vols. 1829); "History and Memoirs, 1789–1848" (8 vols. (1873). He died in Paris, Feb. 25, 1873.

Seidl, Anton, a Hungarian orchestra conductor; born in Budapest, Hungary, May 6, 1850; educated in Budapest and in Leipsic and Beyreuth, under Richter and Wagner. In 1876, on the production of the "Nibelungen" drama in Beyreuth, he was stage director. He obtained the position of conductor at the Leipsic Opera House in 1879 through Wagner's influence. In 1882 he made a tour of Europe as conductor of the Nibelungen Opera Troupe. In 1883 he was appointed conductor at the Bremen Opera House, where he remained till 1885; when he became conductor of German opera in New York city, succeeding Dr. Leopold Damrosch. He afterward directed the concerts of the Philharmonic Society in that city, succeeding Theodore Thomas. He died in New York city, March 28, 1898.

Seidlitz Powder, a mild, cooling aperient, made up in two powders, one, usually in blue paper, consisting of a mixture of Rochelle salt and bicarbonate of soda, and the other, in white paper, of finely powdered tartaric acid. The powders are dissolved separately in water, then mixed, and the mixture taken while effervescing. It is in-

tended to produce the same effect as Seidlitz water.

Seidlitz Water, a sparkling mineral water, imported from the village of Seidlitz, in Bohemia. It is purgative, has a bitter and saline taste, and contains a large proportion of the sulphates of magnesia and lime.

Seigniorage, an ancient royalty or prerogative of the crown whereby it claimed a percentage upon the bullion brought to the mint to be coined or to be exchanged for coin. No seigniorage is now charged for coining gold in Great Britain, but a considerable seigniorage is levied on the silver and copper currencies. As used in the United States, the term seigniorage means the profit arising from the coinage of bullion. The government does not purchase gold bullion, but coins it on private account. There is no profit from its coinage, the face value of gold coins being the same as their bullion value; but at the present ratio of 16 to 1, the face value of the silver dollar is greater than its bullion value; therefore, when silver bullion is purchased and coined into dollars there is a profit arising from such coinage, the amount of which depends on the price paid for the bullion. For example, there are 371¼ grains of pure silver in a dollar, and there are 480 grains of pure silver in a fine ounce. The coinage value of a fine ounce is therefore $1.2929 —. If the fine ounce can be purchased for 70 cents, the profit of its coinage (the seigniorage) is $0.5929 —, and the profit on the 371¼ grains of pure silver in the single dollar is $0.4586 —, which is the difference between the actual cost of the bullion in the dollar and the nominal value of the coin. The silver purchased by the government is carried on the books of the treasury at its actual cost, and the seigniorage is declared on the coinage of each month and paid into the treasury.

Seine (sēn), a large net for catching such fish as mackerel and pilchard. It is often 160 to 200 fathoms long, and 6 to 10 broad, and is buoyed by corks and weighted so as to float perpendicularly.

Seine (sain), a river of France, rising in the department of Côte d'Or; 20 miles N. W. of Dijon, running N. through Champagne to Troyes, where it receives the Aube, and, turning W. is joined by the Yonne, and before reaching Paris, by the Marne, a larger stream, flowing from the W. At Paris the Seine varies from 300 to 500 feet in width, and it soon after receives an addition by the influx of the Oise, when, pursuing a winding course to the N. W., it passes Rouen, and discharges itself into the sea at Havre-de-Grace. Length, 414 miles, for 350 of which it is navigable.

Seine, the smallest, but most important and wealthiest department of France, entirely surrounded by the department Seine-et-Oise; area, 181 square miles. The surface is generally level, with few hills — Mount Valerien, 450 feet (strongly fortified), and Montmartre, 344 feet, being the highest. The soil is calcareous, but rendered productive by manure supplied from the capital. It is traversed by the river Seine. Products, principally vegetables and fruits for the Paris markets; capital, Paris. Pop. (1906) 3,848,618.

Seine-et-Marne, a department in the N. E. of France, comprising a part of the old province of Ile-de-France, having N. the departments Oise and Aisne, E. Aube and Marne, S. Yonne and Loiret, and W. Loiret and Seine-et-Oise; area, 2,335 square miles. The surface is undulating, and the soil fertile. Rivers, Seine, Marne, Yonne, and Ourcq. Products, wheat, oats, rye, barley, potatoes, etc. Numerous cattle and sheep are raised. Manufactures, cotton and linen fabrics, hardware and cutlery, earthenware, leather and paper. Chief towns, Melun, the capital, Coulommiers, Fontainebleau, Meaux, and Provins. Pop. (1906) 361,939.

Seine-et-Oise, a department of the N. of France, having N. the department of Oise, E. Seine-et-Marne, S. Loiret, and W. Eure and Eure-et-Loire; area, 2,253 square miles. The surface is undulating, and the soil generally fertile. Rivers, Seine, Marne, and Oise. Products, wheat, oats, fruit, vegetables, and cattle. Manufactures, woolens and printed fabrics, Sèvres porcelain, leather, chemicals, and hardware. Chief towns, Versailles, the capital, Mantes, Pontoise, Rambouillet, Etampes, and Corbell. Pop. (1906) 749,753.

Seine-Inférieure, a maritime department of the N. of France, formerly comprising the most of the province of Normandy, having N. and W. the British Channel, E. the departments of Somme and Oise, S. Eure and Calvados; area, 2,330 square miles. The surface is hilly and well wooded. The soil is generally fertile. Rivers, the Seine and its affluents. Products, wheats, oats, barley, rye, flax, hemp, hops, and fruits. Manufactures, woolens and cottons. Chief towns, Rouen, the capital, Dieppe, Havre, Neufchâtel, Yvetot. Pop. (1906) 863,879.

Seir Fish, or **Seer Fish,** the *Cybium guttatum*, one of the *Scombridæ* from East Indian seas. In form and size it resembles a salmon, and its flesh, though white, is firm, and very similar to salmon in flavor.

Seisin, or **Seizin,** a right to lands and tenements. In common law seisin signifies possession, as to seize is to take possession of a thing. Seisin is properly applied to estates of freehold only, so that a man is said to be seized of an estate of inheritance, but to be possessed of a chattel interest. There is a seisin in deed, or in fact, when an ac-

tual possession is taken, and a seisin in law where the lands have descended to a person but he has not yet actually taken possession of them. Seisin in deed is obtained by actually entering into the lands. In some of the States, as Pennsylvania, Massachusetts, Ohio, and Connecticut, seisin means merely ownership; and the distinction between seisin in deed or in law is not known in practice.

Seismology, the study of earthquakes. Professor Milne suggests that in addition to what are generally known as earthquakes, seismology should investigate: (1) Earth tremors, or minute movements which escape attention by the smallness of their amplitude, (2) earth pulsations, or movements which are overlooked on account of the length of their period, (3) earth oscillations, or slow and quiet changes in the relative level of the sea and land, which geologists speak of as elevations or subsidences. Oldham's divisions of earthquake shocks include three types, viz.: (1) Condensational waves. (2) Distortional plane waves that travel through the earth. (3) Elastic or surface waves which travel around the earth in both directions. Though seismology can scarcely be said to have existed before the early part of the 19th century, it has a rapidly growing bibliography, and is accumulating a store of facts and observations on which generalizations may be based; and Professor Milne is sanguine that earthquake warnings in countries subject to seismic disturbances will be as common and as trustworthy as the storm warnings at our seaports. In Japan, which is subject to frequent earthquakes, an Earthquake Investigating Committee was formed in 1892, which carries on careful researches in seismology, especially in the practical aspects of the science. See EARTHQUAKES.

Seismograph, a seismometer; an instrument for recording the period, extent, and direction of each of the vibrations which constitute an earthquake. For a complete seismograph, three distinct sets of apparatus are required: (1) To record horizontal motion; (2) to record vertical motion; and (3) to record time. The horizontal and vertical motions must be written on the same receiver, and if possible side by side, while at the instant at which the time is recorded a mark must be made on the diagram which is being drawn by the seismograph. The first instruments were merely modifications of the SEISMOSCOPE (*q. v.*), but successive improvements have been introduced, and the seismograph has been brought to a high pitch of perfection. Some of the best, if not the best forms known are in use in the Imperial Observatory at Tokio, Japan.

Seismometer, a seismograph. The word is sometimes employed to include the seismoscope.

Seismoscope, the earliest and simplest form of earthquake recorder. The first known was invented by a Chinaman named Choko, in A. D. 136, and shows the occurrence and direction of an earthquake by the fall of a column, a principle which was afterward independently adopted in the West. Vessels filled with viscid liquids have been used; the height to which the liquid is washed up the side of the vessel being taken to indicate the intensity, and a line joining the points of maximum motion to denote the direction of an earthquake. Palmieri's seismoscope (probably suggested by Mallett) consists of horizontal tubes turned up at the end, partly filled with mercury. To intensify the motion of the mercury, small floats of iron are placed on the surface, attached by threads to a pulley provided with indices moving in front of a scale of degrees, whence the intensity may be read off. The direction is determined by the azimuth of the tube giving the maximum indication, several tubes being placed in different azimuths. Pendulum seismoscopes, both swinging and fixed, have also been employed.

Seiss, Joseph Augustus, an American clergyman; born in Frederick co., Md., March 18, 1823; was educated at Pennsylvania College; ordained in the Lutheran Church in 1842; held pastorates in West Virginia and Maryland in 1842–1858. In the latter year he was called to the Church of the Holy Communion in Philadelphia; became eminent as a preacher and in the affairs of the Lutheran Church. His publications include: "Popular Lectures on the Epistle to the Hebrews" (1846); "Life After Death" (1878); "Lectures on the Apocalypse" (1881); "Baptist System Examined" (1883); "The Gospel in the Stars" (1885); "Popular Lectures on the Epistles" (1885); "Beacon Lights" (1900); "Dost Thou Believe?" (1900); etc. He died June 20, 1904.

Seistan, or **Hamoon, Lake,** a large, irregularly-shaped, shallow lake or swamp in the W. of Afghanistan, close to the frontier of the Persian province of Khorassan, a division of which province (mainly steppe) is named Seistan after it. The lake is not a single expanse of water, but is divided into three depressions. A great part of the area is generally dry; but, as the basin has no outlet, when the Helmund and its other feeders are in flood this lake regularly overflows its boundaries, fertilizing large tracts of country.

Seisura, or **Sisura,** in ornithology, a genus of *Muscicapidæ*, with five species, from Australia and Austro-Malaya (including Celebes). The best known is *S. inquieta* (*Turdus inquietus*, *volitans*, or *musicola*), the restless flycatcher — the grinder of the colonists; allied to *Rhipidura*. Head and

upper surface shining bluish-black; wings dark; lores deep velvety black, under surface silky white, except sides of the chest. which are dull black. It frequently sallies forth into the open glades of the forest, and procures its prey by poising itself in the air by a remarkably quick motion of the wings, precisely after the manner of the English kestrel, every now and then making sudden perpendicular descents to capture any insect that may attract its notice.

Sejanus, Ælius, the son of a Roman knight, and noted as the favorite of Tiberius, was born at Vulsinii in Etruria. He was commander of the prætorian bands, acquired the confidence of Tiberius, and aimed at the supreme power. He contrived to remove all the members of the imperial family who stood between him and power, but having awakened the suspicion of Tiberius he was executed in A. D. 31.

Sejour, Victor (suh-zhör'), a French dramatist; born in Paris in 1816. He was a mulatto. His plays are in the high romantic vein, and call for gorgeous scenery; among them are: "The Fall of Sejanus" (1849); "Richard II." (1852); "The Devil's Money"; "The Son of Night" (1856); "Mysteries of the Temple"; "The Madonna of the Roses" (1869). He died Sept. 21, 1874.

Selache, or **Selachus,** in ichthyology, a family of *Lamnidæ*, with one species, *S. maxima*, the basking shark; second dorsal and anal very small; gill-openings extremely wide; teeth very small, numerous, conical; snout short, but longer and more pointed in young specimens than in adults, which has led to individuals of different ages being considered as constituting distinct species.

Selaginaceæ, in botany, selagids; an order of perigynous exogens, alliance Echiales; herbs, or small branched shrubs, with alternate, exstipulate, generally sessile leaves in clusters; calyx spathaceous or tubular, persistent, with several divisions, rarely with two sepals; corolla tubular, irregular, five-lobed; stamens four, usually didynamous, rarely two; anthers one-celled; style one, filiform; stigma nearly capitate; ovary superior, fruit two-celled, each cell one-seeded. From the Cape of Good Hope, Asia, Southern Europe, etc. Genera 10, species 120.

Selaginella, a genus of club mosses, readily distinguished from the genus *Lycopodium* by their flat two-ranked stem. They are mostly natives of warm climates, and being often very elegant are objects of cultivation.

Selasphorus, in ornithology, flame-bearers; a genus of *Trochilidæ*, with eight species, ranging from Veragua in Central America to Mexico, thence along Western North America to Nootka Sound. The tail is spreading, and the outer tail feathers are pointed. The throat feathers are elongated at the side, and form a shield of brilliant coloring. The sound produced by their wings when in motion is a loud rattling noise, like the shrill chirrup of a locust.

Selbite, a silver ore of a grayish color originally found at the Wenzel mine, Wolfach, Baden. From its composition it was regarded essentially as a carbonate of silver, but though substances of similar composition have since been found elsewhere, it is still considered to be a doubtful species.

Selborne, Roundell Palmer, 1st Earl of, an English statesman; born in Mixbury, England, in 1812; was educated at Rugby, Winchester, and Oxford; called to the bar in 1837; became solicitor-general in 1861, and attorney-general in 1863; and was lord-chancellor 1872–1874 and 1880–1885. On the formation of Mr. Gladstone's government in 1886, he refused to join the cabinet owing to his disapproval of the prime minister's Irish policy. He was created Baron Selborne of Selborne, Hampshire, in 1872, and Earl of Selborne in 1882. In 1887 he was elected lord rector of St. Andrews University. He published a collection of hymns, and is the author of "The Case against Disestablishment" (1886), and "Churches and Tithes" (1887). He died May 4, 1895.

Selden, John, an English jurist; born in Salvington, Surrey, England, Dec. 16, 1548; wrote many very learned treatises on law — municipal, international, natural, etc.— and on the legislation of the ancient Hebrews; but he is best remembered for his "Table Talk," recorded by his secretary, Richard Milward: of it Coleridge declares that it contains "more weighty bullion sense" than he could find in the same number of pages of any uninspired writer. He died in London, Nov. 30, 1654.

Sel d'Or, a double hyposulphite of gold and sodium, used in photography for toning positive paper-proofs. It is formed when one part of chloride of gold in solution is added to three parts of hyposulphite of soda, also in solution. The hyposulphite of soda should always be in excess during the mixture, a condition which is secured by adding the chloride of gold to the hyposulphite of soda, and not vice versa. The salt so formed is precipitated in fine, white, crystalline needles, on the addition of alcohol to the above mixed solutions; these are collected on bibulous paper, and gently dried for use. Adulterations in the commercial article — which are, unfortunately, only too common — may be ascertained by precipitating, igniting, and weighing the gold contained in the sample it is desired to test. Nitric acid free from

chlorine will decompose this salt, and precipitate its contained gold in the metallic form. Formula, $AuO.S_2O_23(NaO.S_2O_2),4$ Aq.

Selenaldine, in chemistry, $C_6H_{13}NSe_2$; a base produced by the action of selenhydric acid on aldehydrate of ammonium. When the crystals have formed, the selenhydrate of ammonium is removed by de-aërated water, and the crystals dried over oil of vitriol. They are small and colorless, have a disagreeable smell, and are slightly soluble in water, but easily in alcohol. Selenaldine readily decomposes, giving off a fetid gas, and depositing a yellow powder.

Selene. See LUNA.

Selenhydric Acid, H_2Se; selenetted hydrogen or hydrogen selenide; a colorless gas produced by the action of dilute sulphuric acid on potassium or iron selenide. It is very soluble in water, and, like sulphuretted hydrogen, decomposes metallic solutions, insoluble selenides being precipitated.

Selenic Acid, an acid discovered in 1827 by Mitscherlich, and prepared by fusing an alkaline selenite with nitrate of potassium, converting the selenate formed into a lead or cadmium salt, decomposing the latter with sulphydric acid, filtering and concentrating the filtrate by evaporation; symbol $SeO_2(HO)_2$. It is a transparent colorless liquid, boils at 280°, sp. gr.=2.6, and resembles sulphuric acid; its admixture with water being attended with considerable rise of temperature. Selenic acid, boiled with hydrochloric acid, gives off chlorine and is reduced to selenious acid.

Selenides, compounds of the metals, and alcohol radicals, with selenium. The metallic selenides can be produced by fusing selenium with the metal. They are mostly reddish or dark colored, and are more difficultly acted on by nitric acid than the corresponding sulphides. Some occur in nature as rare minerals.

Seleniocyanates, compounds analogous to the sulphocyanates discovered in 1820 by Berzelius; symbol CNMSe = CyMSe. The potassium salt is obtained by fusing potassic ferrocyanide with selenium. It crystallizes in needles, very deliquescent, and soluble in water and alcohol. All the other seleniocyanates are formed either by neutralizing the acid with a base or by precipitation, according as they are soluble or insoluble.

Seleniocyanic Acid, hydric seleniocyanate; symbol CNHSe = CyHSe; prepared by passing a stream of sulphydric acid gas through a warm aqueous solution of lead seleniocyanate, filtering, and boiling the filtrate to expel the excess of sulphydric acid. It is very unstable, the addition of almost any acid causing a precipitate of the selenium.

Seleniocyanic Anhydride, in chemistry, $C_2N_2Se = \left.\begin{matrix}Cy\\Cy\end{matrix}\right\}Se$; obtained by the action of iodide of cyanogen on argentic seleniocyanate. It forms limpid rhombic tables which volatilize slowly on exposure to the air, melts at 60°, soluble in water, alcohol, and ether, and readily decomposed by acids.

Selenious Acid, in chemistry, $SeO(HO)_2$; produced by the hydration of selenious oxide, or the action of nitromuriatic acid on selenium. It is deposited from its hot aqueous solution in prismatic crystals like saltpeter and is a powerful acid, neutralizing alkalies, and decomposing chlorides and nitrates with the aid of heat. It is dibasic, and forms unimportant neutral and acid salts with the alkalies and metals.

Selenite, a name used by some mineralogists for all species of gypsum, by others applied to the crystallized forms only.

Selenium, a non-metallic hexad element occupying an intermediate place between sulphur and tellurium: Symbol Se; at. wt. 79.5. It was discovered by Berzelius in 1817. Though not very abundant in nature, it enters into the composition of many minerals, and has been found in the free state in certain parts of Mexico. It is prepared from cuproplumbic selenide by heating the pulverized ore with hydrochloric acid, igniting the insoluble residue with an equal weight of black flux and dissolving out the selenide of potassium with boiling water. By exposing this solution to the air selenium is deposited as a gray powder. Like sulphur, it occurs in the amorphous and crystalline states. In the former it may be drawn out into ruby-colored threads, and when melted and quickly cooled becomes vitreous with a sp. gr. of 4:3, and nearly insoluble in bisulphide of carbon. In the crystalline condition it forms monoclinic prisms of sp. gr.=4.5–4.7. It boils below a red heat and gives off a deep yellow vapor which condenses in scarlet flowers, and when thoroughly heated burns with a blue flame forming selenious anhydride. It is oxidized and dissolved by nitric acid, yielding selenious acid. It is used in certain electric contrivances on account of the changes its electric resistance undergoes when it is subjected to light.

Selenium Chlorides, in chemistry, the dichloride, $SeCl_2$; obtained by passing a slow stream of chlorine over fused selenium. It condenses as a dark-yellow oily liquid with very pungent odor, and is quickly decomposed with hot water into selenious and hydrochloric acids. The tetrachloride is formed by freely passing chlorine over fused selenium. It forms a white crystalline mass, which on further heating yields a yellow vapor. It dissolves in water, forming selenious and hydrochloric acids.

Selenography, a description of the moon and its phenomena; the art of picturing or delineating the face of the moon.

Seleucia, the name of several ancient cities of Asia, situated in Assyria, Margiana, Syria, Mesopotamia, Cilicia, Pamphylia, Pisidia, Caria, and other countries, of which the following are the most important. (1) SELEUCIA ON THE TIGRIS, was founded by Seleucus I. of Syria, on the left bank of that river, near its junction with the royal canal of Babylonia, and opposite to the mouth of the Delas (now Diala) river, a little S. of the modern city of Bagdad. Commanding the plains of the Tigris and Euphrates, and the principal caravan roads of Assyria and Babylonia, on the confines of which it was situated, and peopled by settlers from various countries of Western Asia, it rapidly rose in wealth and splendor, and eclipsing Babylon, became the capital of that part of Asia, till it was in its turn eclipsed by Ctesiphon, built by the Parthians on the opposite bank of the Tigris. The later wars of the Romans against that people proved destructive to Seleucia. A city of upward of 500,000 inhabitants in the 1st century, in the following it was burned by Trajan and Lucius Aurelius Verus, and captured by Septimius Severus, and in the expedition of Julian against the Persians, in the 4th century, was found deserted. (2) SELEUCIA PIERIA, a strong fortress of Northern Syria, also founded by Seleucus I., whose remains were preserved there in a mausoleum, was built at the foot of Mount Pieria, on a rock overhanging the Mediterranean, a few miles N. of the mouth of the Orontes, and W. of Antioch, with which it was simultaneously founded, and of which it formed the seaport. It surrendered to Ptolemy III. of Egypt, was recovered by Antiochus the Great, and in the latter period of the Syrian kingdom became independent. Under the Romans it rapidly decayed. Considerable ruins of its harbor, fortifications, and necropolis are still to be seen.

Seleucidæ, a dynasty of kings who succeeded to that portion of the empire of Alexander the Great which embraced the Asiatic provinces, and is generally known as Syria. SELEUCUS I., surnamed Nicator, the founder of the line, born about 358 B. C., was a general of Alexander the Great, shortly after whose death (323 B. C.) he obtained the satrapy of Babylon. Subsequently Antigonus forced him to withdraw into Egypt (316 B. C.), but having induced Ptolemy, the governor of Egypt, along with Lysimachus and Cassander, to take the field against Antigonus, he was enabled to return to Babylon in 312 B. C. He gradually extended his possessions from the Euphrates to the Indus, assumed the title of king in 306, and latterly acquired Syria and the whole of Asia Minor, but was assassinated in 280 B. C. He is said to have been the most upright of Alexander's successors, and was the founder of Antioch and other cities. He was succeeded by his son Antiochus I. and by a number of monarchs of the name of Seleucus and Antiochus, the most distinguished being Antiochus the Great. The power of the Seleucidæ began to decline as early as the reign of Seleucus II. (246–226 B. C.), and they successively lost, through revolts and otherwise, Bactria, Parthia, Armenia, Judea, etc., and what subsequently remained was converted into a Roman province in 65 B. C. See ANTIOCHUS.

Seleucides, in ornithology, a genus of *Epimachinæ*. Bill longer than head, nearly straight, compressed, tip emarginate; nostrils oblong, partly hidden by frontal feathers; wings moderate; tail short, composed of 12 nearly equal feathers; tarsi moderate, scutellated; outer and middle toes united at base; claws curved, acute. A single species, *S. alba,* the 12-wired bird of paradise. It was formerly classed with *Epimachus.*

Self-denying Ordinance, a measure carried through the British Parliament in 1645 by the influence of Cromwell and the Independents, by means of which generals who were either less efficient or but half-hearted in the cause were removed from the command of the army. After Manchester's lack of energy at the second battle of Newbury (Oct. 27, 1645), Cromwell had determined on a change of tactics, and attacked Manchester in Parliament, but he soon found the more sweeping measure a better means toward his ends. The lords threw out the measure, whereupon the Commons proceeded to form a new army under Sir Thomas Fairfax as general-in-chief. The lords now passed the measure with some alterations and called on all existing officers to resign. Thus Essex, Waller, and Manchester were got rid of, while Cromwell was specially reappointed to the command of the cavalry as lieutenant-general. For a similar measure, but one suicidal to good government, in the history of the French Revolution, see MIRABEAU: ROBESPIERRE.

Selfridge, Thomas Oliver, an American naval officer; born in Boston, Mass., April 24, 1804; was appointed to the United States navy in 1818, and commissioned a lieutenant in 1827. During the Mexican War he commanded the sloop "Dale" of the Pacific squadron, and took part in the engagements at Matanzas and Guaymas, and in the Civil War served on the steam-frigate "Mississippi" in the Gulf squadron. Later he was promoted rear-admiral; commanded the Mare Island navy yard in San Francisco, Cal.; and was president of

the naval examining board. He was retired in 1866. He died Oct. 15, 1902.

Selfridge, Thomas Oliver, Jr., an American naval officer; born in Charlestown, Mass., Feb. 6, 1836; son of the preceding; was graduated at the United States Naval Academy in 1854, and promoted lieutenant in 1860. During the Civil War he was serving on board the "Cumberland" when she was sunk by the "Merrimac" in Hampton Roads in 1862; commanded the ironclad "Cairo," which was blown up on the Yazoo river; had charge of a battery at the capture of Vicksburg; participated in both attacks on Fort Fisher, and commanded several vessels in the Mississippi fleet. He was promoted commander in 1869 and had charge of the surveys for the canal across the Isthmus of Darien in 1869–1873; was a member of the International Congress at Paris in 1876 and in 1896 was promoted rear admiral. He was retired, Feb. 6, 1898.

Self-sacrificing Saints. See MORELSTCHICKS.

Seligman, Edwin Robert Anderson, an American educator; born in New York city, April 25, 1861; was graduated at Columbia University in 1879; then studied abroad; became Professor of Political Economy and Finance at Columbia University in 1891; editor of the "Political Science Quarterly." His publications include "Railway Tariffs" (1887); "Finance Statistics of American Commonwealths" (1889); "The Shifting and Incidence of Taxation" (1899); "Progressive Taxation in Theory and Practice" (1894); "Essays in Taxation" (1900); etc.

Selim, the name of three emperors of the Turks. SELIM I., son of Bajazet II.; born 1467; dethroned his father and killed his two brothers 1512; defeated the Shah of Persia 1514; conquered Syria and Egypt 1516–1517; died 1520. SELIM II., succeeded his father, Soliman II., in 1566; took Cyprus from the Venetians 1570, and Tunis from the Spaniards in 1571. In the same year he lost the great naval battle of Lepanto; died 1574. SELIM III., son of Mustapha III.; born 1761, succeeded his uncle, Abdul-hamed, 1789. His studies which he had diligently pursued, and the intercourse which he had held with eminent statesmen, made him ambitious of being a reformer; but the ill fortune of the Turks in the wars with Russia and Austria, and the numerous rebellions and insurrections in the various provinces of the empire, long prevented his attempting the task. War with France followed, and Egypt was conquered, but it was recovered by the English and restored to Selim. In 1800 he became protector to the Ionian Islands, and peace being established he applied himself to the difficult work of internal reform. The organization and discipline of the army, the constitution of the divan, and the system of taxation were the matters which he sought to regulate. War with Russia again broke out in 1806, the new army organization, Nizam Jedid, excited immense dissatisfaction, and in May, 1807, the janizaries revolted, and Selim was deposed, imprisoned, and in the following year strangled in Constantinople, July 28, 1808.

Selinus, one of the most important of the Greek colonies in Sicily, founded probably about 628 B. C. on the S. W. coast of that island. Thucydides mentions its great power and wealth, and the rich treasures of it temples. It was conquered by the Carthaginians in 409, and in 249 destroyed by them. There are still important ruins of ancient Greek temples here, and valuable sculptures belonging to them have been preserved.

Seljuks, a division of the Ghuzz confederacy of the Turkish tribes, who were settled on the Jaxartes and in Transoxiana in the 11th century, when they became converts to Islam. Togrul Beg, grandson of a chief named Seljuk (whence the name of the several successive dynasties), severely crippled the empire of Ghazni (1040); then turning W. conquered all Persia, and 10 years later he marched on Bagdad, to the assistance of the Abbasside Caliph, a mere "do-nothing" sovereign, who existed by the favor and protection of a powerful family of the Shiite faith. The head of this family (the Bowides) was, however, the master rather than the protector of the caliph. Togrul seized and supplanted him and being of the orthodox Sunnite faith, was nominated by the caliph "Commander of the Faithful." Dying in 1063, Togrul was succeeded by his nephew Alp Arslan. This sovereign wrested Syria and Palestine from the rival Fatimite caliph of Egypt, and in 1071 defeated the Byzantine emperor Romanus Diogenes, and captured him. The price of his release was a heavy ransom and the cession of great part of Anatolia or Asia Minor to the Seljuk. Alp Arslan was stabbed by a captive enemy in distant Turkestan (1072), and was succeeded by his son Malik Shah. His reign is chiefly remarkable for the enlightened rule of his grand vizier, Nizam ul-Mulk, the schoolfellow of Omar Khayyam, the poet, and of Hassan ben Sabbah, the founder of the ASSASSINS (*q. v.*). This statesman founded a university at Bagdad, an observatory, and numerous schools and mosques, and with the help of his old friend Omar Khayyam revised the astronomical tables and introduced a new era, the Jelalian.

After the death of Malik (1092) the extensive empire began to break up into smaller kingdoms. But already during his lifetime, and even that of his predecessors,

powerful tributary princes had ruled over separate provinces in Syria, in Kerman (beside the Persian Gulf), and in Asia Minor. During the first half of the 12th century the most powerful of these provincial rulers was Sinjar, who governed Khorassan, with Merv for his capital. He spent his life fighting against the Ghaznevids, against the Turkestan chiefs, and latterly against the Mongols. But a stronger and more immediate interest attaches to the province of Syria and that of Asia Minor, or Rum, as the Seljuks preferred to call it. It was the rulers of these two provinces or kingdoms who persecuted the Christian pilgrims and so provoked the CRUSADES (*q. v.*), and it was the rulers of the same two kingdoms against whom the crusaders of Europe principally fought. The capital of Rum was fixed at Iconium (Konieh) in the first half of the 12th century. This dynasty reached the acme of its power under Kaikavus (1211–1234), who ruled over nearly the whole of Asia Minor and extensive territories in Mesopotamia and Northern Persia.

During the reign of his son Kaikhosran II. the poet Jelal-ed-Din Rumi flourished and the various orders of dervishes arose; and at the same time the Mongols began to threaten the E. borders of the state. Indeed from about 1243 the real sovereign power of that part of Asia was in the hands of the Mongol chiefs, Hulagu and his successors, till the rise of the Ottoman princes. These last, Turks like the Seljuks, had retreated W. before the all-conquering Mongols about the middle of the 13th century, and at the end of it they entered the service of the Seljuk ruler of Asia Minor. After that the name Osmanli or Ottoman soon superseded that of Seljuk as the appellative of the Turkish rulers and ruling classes in Asia Minor. And out of the Ottoman supremacy grew the empire of Turkey. The Seljuks, however, had centuries before, while they were still settled in Transoxiana, lost a good many of their peculiarly Turkish characteristics and had become "Turkomans," *i. e.*, "Like the Turks"; and with their conversion to Islam they also adopted the Perso-Arabian civilization and customs, though still retaining their own language as well as using those of the peoples they had conquered.

Selkirk, Alexander, a Scotch adventurer; born in Largo, Scotland, in 1676. He was a skillful seaman, and made several voyages to the South Sea, in one of which, having quarrelled with his commander, he was put ashore on the island of Juan Fernandez, with a few necessaries, a fowling-piece, gunpowder, and shot. Here he lived alone during four years and four months, and was then rescued by Captain Woods Rogers. During the time of his remaining on the island he had nearly forgotten his native language. He returned to England in 1711, and is said to have given his papers to Defoe, who took from them his story of "Robinson Crusoe"; but there is little doubt that the latter was indebted to Selkirk for little more than the main idea of the work. He died on the ship "Weymouth," in 1723.

Selkirk Mountains, an outlying range of the Rocky Mountains, in British Columbia, extending S. from about lat. 52° N. to near the United States frontier. The Canadian Pacific railway climbs over the mountains at a point 4,300 feet above the sea.

Sellar, William Young, an English critic; born in Morvich, Sutherland, Feb. 28, 1825; was educated at Edinburgh Academy and Glasgow University, from which he passed to Balliol College, Oxford. In 1850 he was elected to a fellowship at Oriel; next acted as assistant professor at Durham, Glasgow (1851–1853), and St. Andrews (1853–1859); filled for six years the Greek chair at St. Andrews; and was elected in 1863 to the Latin chair at Edinburgh, which he retained till his death near Dalry, Galloway, Oct. 12, 1890. He made his name widely known by his learned and brilliant book, "The Roman Poets of the Republic" (1863; revised and enlarged, 1881), which was followed by "The Roman Poets of the Augustan Age — Vergil" (1877), and "Horace and the Elegiac Poets" (1892), the latter edited from his papers by his nephew, Andrew Lang, with a brief memoir prefixed. Of the last volume — the completion of his task — the part treating of Ovid alone is unfinished. The whole forms a noble *corpus* of criticism on the greatest poets of Rome, marked by full knowledge, insight at once keen and sympathetic, and a fine dignity of style — a quality in modern days too rare.

Selling Short, a proceeding in the stock market conducted as follows: A customer X directs broker A to sell short 100 shares of Union Pacific at par. Broker B buys it. A, not having the stock, goes to broker C, and borrows from him 100 shares of Union Pacific, giving as security $10,000 in cash. This stock is then delivered by A to B, who pays A $10,000 therefor. Matters then rest till Union Pacific advances or declines enough to make X wish to close his account, he then directs A to buy Union Pacific, say at 95, and A gets the stock from Broker D. The stock thus obtained is delivered to C, who thereupon returns the money which he has had as security and $9.500 of the amount goes to D, leaving $500 less expenses as the profit of X on the transaction. While X is waiting to see what the market is going to do, C has the use of A's $10,000, and under ordinary con-

ditions pays interest on this money. This interest is called the loaning rate on stocks and is usually a little below the current rate for loans on collateral.

The lower these rates are, compared with the rate for money the more demand there is to borrow that particular stock, and the loaning rate is the point to be watched by those who may be short, to see whether the short interest is large or small. In case the demand to borrow a certain stock is very large, the loaning rate will be quoted flat, which means in the case cited that C would get the use of A's $10,000 without paying any interest. If the demand for the stock should be still greater A might have not only to give C the $10.000 without interest, but pay C a small premium in addition. When the loaning rate of stock is quoted at 1–32, it means that C gets his $10,000 from A without interest, and in addition a premium of $3.12 a day for each 100 shares, which has to be paid by X, who must also pay all dividends that may be declared on the stock.

In ordinary lines of business, selling short with the idea of borrowing for delivery would be impossible. In the stock market, it is impracticable to sell distributed bonds or investment stocks short because such securities are held by investors, and are not carried in quantity by brokers, hence, could not be readily borrowed. But in active stocks there is no difficulty whatever in borrowing. The reason is this: every broker who carries many stocks employs a great deal more money than he possesses. In theory, a broker carrying for a customer 100 shares of Union Pacific at par would make up the money for the purchase by using $1,000 belonging to the customer, $1,000 of the money of the brokerage firm, and then borrow $8,000 from a bank on the security of the 100 shares of stock purchased.

An active broker consequently is always a large borrower of money, and when he borrows from a bank he is expected to put up 20 per cent. margin on his loan. But, if he can lend stocks he gets the full value of the stock and does not have to put up any of his own money or of his customer's money. Hence, every broker is willing to lend stocks particularly when the demand for stock is sufficient to make the rate of interest lower than the market rate as the broker in this case makes a profit by charging his customer who is long 5 or 6 per cent. interest, while he perhaps secures his money without any cost through lending the stock flat. This from the standpoint of the short seller, is what makes his operation practically safe. Ordinarily, it is just as easy to borrow active stocks, as it is to borrow money, and squeezes of shorts through inability to borrow are little if any more frequent than squeezes of "longs" through the difficulty of brokers in borrowing money.

In picking out a stock to sell short, the first consideration ought to be that the price is above value, and that future value appears to be shrinking. It should be an active stock and if possible a stock of large capital. It should be an old stock by preference, which means having wide distribution instead of concentrated ownership. By preference, it should be a high priced stock with a reasonable probability that dividends will be reduced or passed. Such a stock should be sold on advances and bought in on moderate declines, say 4 or 5 points, as long as the market seems to be reasonably steady. But, if the market becomes distinctly weak, only part of the short stock should be bought in with the hope that some short interest may be established at a price so high as to be out of reach of temporary swings. The best profits in the stock market are made by people who get long or short at extremes and stay for months or years before they take their profit.

Selma, a city and county-seat of Dallas co., Ala.; on the Alabama river, and on the Western of Alabama, the Birmingham, Selma, and New Orleans, the Mobile and Birmingham, and the Louisville and Nashville railroads; 50 miles W. of Montgomery. Here are Selma University (Bapt.), the Burrell School for Colored Pupils, Dallas Academy, electric lights, National and State banks, and several daily and weekly newspapers. There is regular steamboat connection with Mobile. The city has an ice factory, cotton-seed oil mill, railroad machine and car-wheel shops, a planing mill, iron works, extensive cotton factories, etc., and an assessed property valuation of nearly $4,500.000. During the Civil War the city contained an arsenal, extensive powder works, and a gun foundry. It fell into the hands of the Union forces a few days before the surrender of General Lee. Pop. (1890) 7,622; (1900) 8,713; (1910) 13,649.

Selous, Frederick Courtenay, an English explorer; born in London, Dec. 31, 1851. He made a name as a gold prospector, explorer, and elephant hunter in South Africa, where he spent many years; and during the Matabele campaign fought on the side of the colonists. He wrote: "A Hunter's Wanderings in Africa" (1881), "Travel and Adventure in Southeast Africa" (1893); and "Sunshine and Storm in Rhodesia" (1896).

Selvas, or **Silvas,** great tracts of low flat land, covered with dense vegetation and forest trees, which occur along the course of the river Amazon in South America.

Seltzer Water, a carbonated mineral water imported from Lower Selters, in the duchy of Nassau. It contains common salt

and the carbonates of soda, magnesia, and lime, and is recommended as a mild stimulant and diuretic. An artificial seltzer for domestic use is prepared by adding minute quantities of common salt and carbonate of soda to distilled water, and highly impregnating with carbonic acid gas.

Selwyn, George Augustus, an English bishop; born April 5, 1809; was educated at Eton and at Cambridge; rowed in the first inter-university boat race (1829); and was a great pedestrian and swimmer, athletic powers found very serviceable in after life. In 1841, while curate of Windsor, he was consecrated first and only Bishop of New Zealand and Melanesia — now divided into seven secs. On the voyage out he studied Maori and navigation, so that he could preach to the natives in their own tongue on his arrival, and could steer his own vessel on his missionary voyages. He visited every portion of his huge diocese before setting about his great work of organizing it. A visit to England in 1854 brought back John Coleridge Patterson, afterward the martyred Bishop of Melanesia, to whose see Bishop Selwyn's second son was consecrated in 1877. In 1867 Bishop Selwyn attended the first Pan-Anglican Synod at Lambeth, and against his own inclinations was appointed Bishop of Lichfield — the see of the Black Country — where on his initiative the first Diocesan Conference in which the laity were duly represented met in 1868, and where he died, April 11, 1878. A devoted Churchman, with love to God and loyalty to his sovereign and his archbishop as his guiding principles, he thought no duty too humble, no act of kindness too trifling, and no work to which he was sent too difficult to undertake. Possessing in a special degree the gift of organization, and always regarding himself as "a man under authority," he expected the same soldier-like obedience from those under him. He did much to make Lichfield the life-giving, spiritual heart of the diocese, and so fulfil his high ideal of the cathedral system.

Selwynite, a massive, emerald-green mineral, found near Heathcote, Victoria, in the Upper Silurian formation: hardness, 3.5; sp. gr., 2.53; sub-translucent. Composition: A hydrated silicate of alumina and magnesia, with some hydrous chromic oxide. Recent researches tend to support the view that it is a mixture.

Semaphore, a kind of telegraph or apparatus for conveying information by visible signs, such as oscillating arms or flags by daylight, and by the disposition of lanterns by night. The various combinations may serve to indicate the numbers corresponding to certain expressions in a tabulated code, or may be employed to represent the letters of the alphabet. In one old form the signal arms were each made to assume one of six different positions when required. By various combinations of these positions, the alphabet, numerals up to 10, arbitrary signs and symbols could be represented. A simple form of the apparatus is used on railways to regulate the traffic.

Sembrich, Marcella, an Austrian opera singer; born in Lemberg, Austria, Feb. 18, 1858; received her first instruction on the piano and soon afterward took up the study of the violin. In 1876 she gave up her instrumental work to study singing, and went to Milan, where for nearly three years, she was a pupil of Lamberti. Her first appearance was in "I Puritani," at Athens, where her singing attracted considerable attention. Subsequently she appeared in all the large cities of Europe with great success, and in 1883 came to the United States. She reappeared in concerts in the United States in 1897–1898, and in 1898–1899 was a member of the Grau Opera Company.

Semecarpus, a genus of *Anacardiaceæ;* flowers polygamous; calyx five-cleft; petals and stamens five; styles three; nut compressed, heart-shaped, on a thick and depressed torus. Anacardium is a deciduous tree, growing in the sub-Himalayan tract, from the Sutlej E., and ascending to 3,500 feet. It is called the marking nut tree because the pericarp of the fruit contains a bitter and astringent principle used everywhere in India for marking ink; with lime water it is made into an ordinary ink; and it is also used as a black dye. Pounded and boiled in rape oil, it stays putrefaction when begun in a hide. The resin of the tree yields the varnish of Sylhet. An oil derived from it, mixed with the milk of *Euphorbia,* is made in the Satpoora hills into birdlime. The acrid juice of the nuts is used also in rheumatism and leprosy, and to ward off the attacks of white ants. Its seeds, called malacca beans or marsh nuts, are eaten; so is the yellow fleshy cap surrounding the seeds, which is roasted in ashes. The wood of the tree is sometimes burnt as charcoal. *S. panduratus,* a tree growing in Pegu and Mastaban, and *S. travancorica,* found in the Tinnevelly and Travancore Hills, abounds in a caustic black juice or resin.

Semele, in zoölogy, a genus of *Tellinidæ,* with shell rounded and sub-equilateral, the beaks turned forward; hinge teeth 2–2, partial sinus deep, rounded. Recent species 60, from the warmer seas; fossil 30, from the Eocene of America and Europe onward.

Semele, in classical mythology, a daughter of Cadmus by Hermione. She was beloved by Jupiter; but Juno, determining to punish her rival, visited the house of Semele in the guise of her nurse, and persuaded her to entreat her lover to come to her with the same majesty as he approached

Juno. Jupiter had sworn by the Styx to grant Semele whatever she required; he therefore came attended by the clouds, the lightning, and thunder-bolts. Semele, unable to endure so much majesty, was instantly consumed by fire. Her child was, however, saved from the flames by Mercury. This child was called Bacchus, or Dionysius.

Semibreve, a whole note, a note whose length is half that of a breve. It is the longest note generally used in modern music and is the integer whose fractions are usually adopted to express the length of other notes.

Semicolon, in grammar and punctuation, the point (;), marking a greater distinction of sense than a comma, but less than a colon. It is used to distinguish the conjunct members of a sentence.

Seminoles, a tribe of American Indians, originally a vagrant branch of the Creeks, whose name, *Seminole,* signifies "wild" or "reckless." In 1805, they aided in driving the Appalaches from Florida; and in 1817, they joined with the Creeks and some negroes who had taken refuge with them, ravaged the white settlements in Georgia, plundering plantations, and carrying off slaves, whom they refused to surrender. General Jackson, sent to punish them, took at the same time several Spanish forts, and hastened the negotiations which ended in the cession of Florida to the United States. By this cession, in 1823, the Seminoles engaged to retire into the interior and not molest the settlers; but as the negroes continued to take refuge with them, a treaty was made with some of the chiefs, in 1832, for the removal of the whole tribe W. of the Mississippi. This treaty was repudiated by the tribe, at the instigation of Osceola (*q. v.*), one of their chiefs. A war commenced, in which battles and skirmishes were of constant occurrence, and with various results. This war, which lasted seven years, and cost the government about $10,000,000 and the loss of 1,466 lives, ended in 1842, when the Seminoles, except some 200 who took refuge in remote places, were removed to the Indian Territory, where nearly all the members of the tribe are now settled. They number 2,900 (1899), receive an annuity of $25,000, have churches, and are under the training of missionaries of the Presbyterian denomination. The remnants in Florida had increased, in 1899, to 575.

Semiopal, a siliceous mineral, nearly resembling the common opal, but differing from it in being harder and more opaque, in exhibiting a less perfect conchoidal fracture, and in the muddiness of its colors. It is found at Okehampton, in Devonshire, and in Cornwall, England, at Wheal Buller, and near St. Ives and St. Just.

Semioptera, the standard-wing, a genus of *Paradiseinæ,* with one species, *S. wallacii,* discovered by A. R. Wallace in 1858, in Batchian, one of the Moluccas, to which group it appears to be confined. Bill long, compressed, culmen much curved, tip emarginate; nostrils basal, oval, hidden by frontal plumes; wings rounded, fourth and fifth primaries equal and longest; tail moderate, slightly rounded; tarsi long, rather slender, covered by a single scale; toes slender, rather short; claws long, much curved, acute.

Semipalatinsk, or **Semipolatinsk,** a fortified town of Siberia, on the Irtish. It consists chiefly of wooden buildings facing the river, and carries on a considerable trade with the Kirghiz and with Tashkend Khokand, Bokhara, and Kashgar. Pop. (1897) 26,353. The province of Semipalatinsk has an area of 184,631 square miles. It is mountainous in the S. E., consists of steppe land in the N. W., and is one of the warmest regions of Russian Asia in summer, though the winter is rather extreme. The chief occupation of the people is cattle rearing. Pop. 685,197.

Semi-Pelagianism, in Church history, a modification of the doctrines of the Pelagians, consisting chiefly in maintaining the sufficiency of man's natural power, only so far as regards the first act of conversion to God, and the initial act of man's repentance for sin Semi-Pelagianism took its rise in 428, from John Cassian, a pupil of Chrysostom at Marseilles. The Council of Orange, July 3, 529, established the Augustinian doctrines in opposition to those of the Pelagians and Semi-Pelagians, as did that of Valencia, in July or August, 530; and Pope Boniface II. confirmed the decree in 530.

Semiquaver, in music, a note half the length of the quaver.

Semiramis, a queen of Assyria, whose history is enveloped in fable. As the story goes, she was a daughter of the fish goddess Derceto of Ascalon, in Syria, by a Syrian youth. Being exposed by her mother, she was miraculously fed by doves till discovered by the chief of the royal shepherds, who adopted her. Attracted by her beauty, Onnes, governor of Nineveh, married her. She accompanied him to the siege of Bactra, where, by her advice, she assisted the king's operations. She became endeared to Ninus, the founder of Nineveh (about 2182 B. C.), but Onnes refused to yield her, and being threatened by Ninus, hanged himself. Ninus resigned the crown of Semiramis, and had her proclaimed Queen of Assyria. She built Babylon, and rendered it the mightiest city in the world. She was distinguished as a warrior, and conquered many of the adjacent countries. Having been completely defeated on the Indus, she was either killed

or compelled to abdicate by her son Ninyas, after reigning 42 years. According to popular legend, she disappeared or was changed into a dove, and was worshiped as a divinity. Her whole history resembles an Oriental tale, and even her existence has been questioned. She is probably a mythological being corresponding to Astarte, or the Greek Aphrodite.

Semites, a name given by J. G. Eichhorn in 1787 to a group of nations closely allied in language, religion, manners, and physical features, who are represented in Gen. x. as descended chiefly from Shem, a son of Noah. Their habitat is Abyssinia, Arabia, Palestine, Phœnicia, Syria, and the countries of the Euphrates and Tigris. Into those lands, according to one theory which is supported by Lenormant and others, there had preceded them an immigration of Cushites of the Hamitic race, who, proceeding from Central Asia, occupied not only the lands that afterward became Semitic, but also the Nile valley. Their Hamitic language and civilization, the Semites are said to have adopted. In language the Semites do show some affinity with the Berbers and the inhabitants of the Nile valley, and Gen. x. does, for political and geographical or other reasons, distribute the sons of Ham and Shem in a peculiar manner. But the increasingly prevalent theory is that not less than 4000 years B. C. the Semites migrated as nomadic tribes, probably from Arabia, into Mesopotamia. There they found a Turanian population dwelling in cities built of brick, under the regular government of priest kings, skilled in the use of metals, using the cuneiform mode of writing, and comparatively far advanced in literature and culture. The hold of the Semites on Shumir, the lower, more fertile, and more thickly inhabited part of the Euphrates valley, was not at first so strong as on Accad, the upper part. In 3800 B. C. the Semitic adventurer Sharrukin usurped the kingdom of Accad. In Elam also the Turanian population was early overpowered by the intruding Semites, who came to form the upper strata of society. In 2280 B. C. the Semite Khudur-Nankhundi of Elam invaded and conquered Shumir and Accad, founding the Elamite line of princes; and about 2200 B. C. one of his successors, Khudur-Lagamar (Chederlaomer), carried his conquests as far as Palestine (Gen. xiv.).

These painful and oppressive impulses, and probably others like them, seem to have occasioned emigrations of many Semites. Some proceeded toward the N. W., reached the Mediterranean Sea, founded Sidon, Tyre, and other cities, and became known afterward as Canaanites or Phœnicians. Later, from Ur went others in the same direction, settled behind the Phœnicians, and were afterward known as Israel. Others went N. and built cities which developed into the empire of Assyria. While the Semites were in Mesopotamia they used the Turanian language in their public documents till they attained the ascendant in political power; and when afterward they used their own language they continued to use the Turanian cuneiform mode of writing. The Turanian religion also was adopted by the Semites, and mixed with what religion their own primeval tribal religion or totemism had developed into. This amalgamation was consummated by Sharrukin II. of Accad about 2000 B. C.

The Semites as a race have a fine physical organization, are mentally quick, clever, but not inclined to change, and not persistent in progress. They have been distinguished by a brilliant imagination and love of the beautiful; but have not shone in philosophy or in science. Their literature has neither epic nor dramatic poetry worth notice. Almost their only arts are the sculpture of Assyria, the exquisite glass and pottery, and the textile fabrics and embroidery of the Phœnicians. Impatient of restraint, the Semites have not by political aptitude welded together themselves or others into large, compact, and enduring commonwealths. They have made their mark on the world in the Phœnician commerce, which visited even the Atlantic shores of Spain and France and drew tin from Britain; in the Phœnician colonies, which, dotting all the coasts and many islands of the Mediterranean Sea as far as Cadiz, and the coast of Asia as far as India, dispensed manufactures, developed primitive navigation (even to the extent of circumnavigating Africa more than 2,000 years before Vasco da Gama), stimulated industry, trade, and ingenuity, and radiated the light of material civilization; in the Carthaginian empire within Europe and Africa; in the exploits of Hannibal; in the dissemination of alphabetic writing, whereof the Phœnician form was the mother of the European and of most Asiatic alphabets, while the alphabet of the great Sabæan kingdom, or of the great and still more ancient Minæan kingdom in Arabia, is apparently the oldest of all alphabets hitherto discovered; in the Babylonian and Assyrian empires; in the Hebrew Bible and the Jewish religion; in the New Testament and the Christian religion; in the Koran and the Mohammedan religion; in the Mohammedan conquests and empire; and in the preservation of culture thereby during the Dark Ages and the Middle Ages.

Semitic Languages, the languages spoken by the Semitic nations. One characteristic feature of them is triconsonantal roots from which by prefixed or affixed letters, but mostly by internal vowel changes, the other words are formed. Thus in Arabic *kátăbă* = "he wrote," *kâtib* = "a scribe,"

kitâb = "a book," *maktûb* = "an epistle." Another characteristic feature is that, though personal pronouns are affixed to nouns, verbs, and prepositions, there is an almost total absence of derivative nouns, adjectives, and verbs. Thus, while in Arabic *beitî* = "*my* house," *qatalahu* = "he killed *him*," *minhâ* = "from *her*," there are no such derivatives as pro-motion, dread-ful, grati-fy. Other characteristic features are a verb with two tenses, and the simple structure of sentences, which are mainly formed by juxtaposition of clauses helped by "and." Semitic languages have a much closer family likeness than the Indo-European, and show a large proportion of common words. The most highly developed, and on the whole the most characteristic (probably also the oldest of the group), is Arabic, which, with its ancient Sabæan, and Minæan dialects of Southern, Western, and Northern Arabia, and with Ethiopic, forms the S. division of Semitic languages, marked by the use of "broken plurals," in which the consonants of the singular are preserved, while the vowels are as much altered as possible. Thus from the Arabic *kitâb*, "a book," comes the plural *kŭtŭb*. Another mark is the universal use of *a* before the third radical letter of the active preterites; thus Arabic has *qáttala*, *áqtala*, for which Hebrew has *qittêl* and *hiqtîl*. Another mark is the distinction between the Arabic *sâd* and *dâd* which are united in the Hebrew letter *tsâdc*.

Hebrew, though a characteristically Semitic speech, shows many marks of linguistic decadence; ancient Hebrew is a more modern type of language than modern Arabic. Phœnician differs little in grammar and dictionary from Hebrew. In the African territory of Carthage this language was spoken 400 years after the Christian era; a century before that era in Phœnicia itself it yielded to Aramæan or to Greek. Our only examples of it are a few corrupt sentences in the "Pœnulus" of Plautus, and inscriptions, most of which date from the 4th century B. C. or later, few belonging to the preceding three centuries. Moabitic, as the Moabite Stone of the 9th century B. C. shows, was Hebrew. Aramæan had its home in Aram of Damascus and Aram of Mesopotamia. It was the language of Assyria from early times, as we may see in II Kings xviii., and of Babylonia, even while Assyrian was used there for official purposes. It was the official language of the provinces of the Persian empire W. of the Euphrates. Its W. branch was the language of Palmyra and of the N. part of the Arabian kingdom of the Nabatheans, and is seen in the Biblical books of Ezra and Daniel, where it has been erroneously named Chaldee. Later developments of this branch are the officially recognized "Targums" by Onkelos on the Pentateuch, and Jonathan on the Prophets, which were finally edited and fixed in the 4th or 5th century A. D. in Babylonia. Somewhat later are some "Midrashes," the Jerusalem "Targums," and the Jerusalem "Talmud." Of the 4th or 5th century are Palestinian translations of the Gospel. Samaritan is another branch of Western Aramæan, written in a Hebrew alphabet older than the Captivity, and spoken about 432 B. C. by an Aramæan people with Israelitish blood in them, who were desirous of conforming in speech as in religion to the Hebrew usage of Northern Palestine. Arabic soon expelled Western Aramæan after the Mohammedan conquest, though a faint echo of it still lingers in the Anti-Libanus. The Babylonian Talmud shows the common Eastern Aramæan of Babylonia from the 4th to the 6th century. The language of the Mandæan sect resembles it. In the 2d century the Edessan dialect of Aramæan, which we call Syriac, began to be the language of Eastern Christendom for all purposes; but for popular use it was slowly supplanted by Arabic after the Mohammedan conquest, becoming a dead and almost entirely ecclesiastical language. In the mountain regions of ancient Assyria Aramæan is still represented by several local dialects among Christians and even Jews. Assyrian, so called by us moderns because discovered by us in Assyria, is more correctly named Babylonian. It is written in the difficult, cumbrous, and inadequate cuneiform character received from the Turanian natives. It shows scarcely any sign of a preterite tense. In popular use it early gave way to Aramæan. Ethiopic, a sister tongue to Arabic, in some respects resembles more closely Hebrew and Aramæan even in the most ancient form of the language known to us.

Semi-Universalists, a name given to those members of the Reformed Churches in Germany who held that God wishes to make all men happy, but only on condition of their believing; and that this faith originates from the sovereign and irresistible operation of God, or from the free, unconditional, and sovereign election of God.

Semmering, a mountain of Austria, 4,575 feet high, on the borders of Styria and Lower Austria, 44 miles S. W. of Vienna. It is crossed by the Semmering railway, the first of the mountain railways in Europe. The railway is carried along the face of precipices, through 15 tunnels, and over 16 viaducts, the surrounding scenery being magnificent. It was constructed at a cost of $5,000,000 for the Austrian government between 1848 and 1853.

Semmes, Alexander Jenkins, an American surgeon; born in Georgetown, D. C., Dec. 17, 1828; was graduated at the National Medical College, Washington, in 1854. He later settled in New Orleans; was made

a surgeon in the Confederate army in 1861, and was with Gen. Thomas J. Jackson in Virginia till 1862, when he was appointed medical inspector of the Department of Northern Virginia. In 1863 he was inspector of hospitals in the Department of Virginia. In 1870–1876 he was Professor of Physiology at the Savannah Medical College. He afterward joined the Roman Catholic Church, and in 1886 was made president of Pio Nono College, Macon, Ga. His publications include "Medical Sketches of Paris" (1852); "Gunshot Wounds" (1864); "Surgical Notes of the Late War" (1867); "Evolution the Origin of Life"; etc.

Semmes, Raphael, an American naval officer; born in Charles co., Md., Sept. 27, 1809; was appointed, in 1828, a midshipman on board the "Lexington," and rose by successive steps to the rank of commander in 1855. He was nominated, in 1858, secretary to the Lighthouse Board, which situation he held when the war broke out. He then joined the Confederate service, March 26, 1861, and was made commander of the war steamer "Sumter." With this vessel he caused considerable damage to the United States merchant navy, and having been driven into the port of Gibraltar by stress of weather, sold her to a "neutral." He was then ordered to take the command of a vessel built in England, and known at first as "290," which afterward became famous as the "Alabama." His exploits while commander of this vessel, though not so dashing as those of Paul Jones during the first American war, were far more destructive. After having inflicted an enormous amount of loss on the National commerce, the "Alabama," which had been into Cherbourg, France, for repairs, encountered outside the harbor a United States war steamer, the "Kearsarge," Capt. John A. Winslow, June 10, 1864. A French man-of-war followed her to prevent any violation of international law. The fight took place about 9 miles from Cherbourg, and was both short and decisive. The "Kearsarge," a powerful ship, was defended by iron chains slung over the bulwarks, on which the shot of the "Alabama" could make but little impression; and in rather more than an hour from the beginning of the fight the "Alabama" was completely disabled. The crew tried to reach the French coast with her, but failed in the attempt, and she began to sink. Commander Semmes, and some of the sailors, including 13 officers, were saved by the boats of an English steam yacht, the "Deerhound," which had accompanied the "Alabama" from Cherbourg to be a spectator of the fight. Semmes succeeded, after some difficulty, in making his way back to the Southern States; but the effectual blockade of their ports deprived him of any further chance of continuing his adventurous career. He wrote the "Cruise of the Alabama and Sumter," and the "Log of the Alabama" (1864); "Memoirs of Service Afloat" (1868). He died in Mobile, Ala., Aug. 30, 1877.

Semnopithecus, sacred monkeys, sacred apes; the type-genus of the *Semnopithecinæ*, distinguished from *Colobus* by the presence of a small functional thumb and their absence from Africa. The species are numerous, spread over almost the whole of the Oriental region, wherever the forests are extensive. They extend along the Himalayas to beyond Simla; on the W. of India they are not found N. of lat. 14° N., on the E. they extend into Arakan, and to Borneo and Java, but apparently not into Siam or Cambodia. One species (*S. roxellana*) was discovered by Père David at Moupin, in East Tibet, where the winters are severe, and the whole vegetation is palæarctic. The monkeys of this genus vary much in size, the largest are bigger than a pointer; the body in all long and slightly made, and the tail pendulous.

Semolina, a term applied to a kind of wheat meal in large, hard grains, used for making puddings, thickening soup, etc. In grinding, the millstones are so adjusted as to leave the product in a granular form and not reduced to a state of flour. The hard wheats of Southern Europe are best adapted for this purpose.

Sempach, a village of Switzerland, in the canton and 8 miles N. W. of Lucerne, on Lake Sempach. It is remarkable as being the scene of a great victory which the Swiss gained over the Austrians under Duke Leopold, who was slain, together with 600 nobles and upward of 2,000 troops. The victory was attributed to the heroism of ARNOLD OF WINKELRIED (*q. v.*).

Sempervivum, a genus of succulent or herbaceous plants, order *Crassalaceæ*. *S. textorum*, the common houseleek, is a well-known plant, with thick fleshy leaves, arranged in the form of a double rose. It is commonly to be met with on the tops of outhouses and cottages, and is considered to possess cooling properties. *S. cæspitosum* has been known to remain alive in a herbarium for 18 months, and, when subsequently planted, to grow.

Senaar, a region of Africa, forming an administrative district of the Egyptian Sudan; area, about 115,000 square miles, between the Bahr-el-Azrek, or Blue Nile, and the Bahr-el-Abiad, or White Nile. The country is mostly flat and sterile, but well cultivated on the river banks, where are numerous towns or villages. The population, estimated at 1,500,000 is greatly mixed. Originally an independent Negro kingdom,

it was afterward subject to Egypt, but Khartum, the Egyptian headquarters, and the whole country were abandoned consequent upon the Sudanese rebellion. The town of Senaar, on the Blue Nile, with about 8,000 inhabitants, had a fairly extensive trade, but was utterly destroyed during the revolt of the MAHDI (*q. v.*) See SUDAN.

Senacia, in botany, a genus of *Celastraceæ;* shrubs with smooth branches; feathery veined, entire leaves; terminal corymbs of white flowers, with hypogynous stamens. Akin to *Celastrus. S.* (formerly *Celastrus*) *undulata* furnishes a hard wood.

Sénancour, Etienne Pivert de (sen-äng-kör′), a French author; born in Paris, in 1770. Under the direct influence of Rousseau he wrote "Reveries on the Primitive State of Man" (1799). Among his other works are: "Obermann" (2 vols. 1804), in the same vein; "Love According to Primordial Laws, and According to the Conventions of Society" (2 vols. 1805); "Free Meditations of an Unknown Solitary on Detachment from the World" (1819); "Sum of the Traditions of Morality and Religion" (2 vols. 1827), which brought on him legal prosecution for impiety; and "Isabella," a novel (1833). He died in St. Cloud, France, in 1846.

Senarmontite, an isometric mineral, occurring in octahedrons with octahedral cleavage, also granular, massive; hardness, 2–2.5; sp. gr. 5.22–5.3; luster, resinous to sub-adamantine; colorless or grayish; streak, white. Composition: Oxygen, 16.44; antimony, 83.56 = 100, equal to the formula, Sb_2O_3. Results principally from the decomposition of stibnite, the finest and largest crystals being found in Algeria.

Senate, in ancient history, the deliberative assembly of the Roman people; but the term has been applied to very different powers and constitutions in different countries. In the Greek republics, as well as among the Romans, the number of senators was regulated by the number of tribes into which the state was divided. Accordingly, while Attica was divided into four tribes, the number of senators was 400; and when the number of tribes was increased to 10, the number of senators was also enlarged to 500. The Roman Senate, during the primitive days of the city, participated in the judicial and executive powers of the king, and even in the management of military affairs. Romulus was said to have originated the Senate; but in doing this, he only imitated all the civilized nations dwelling on the shores of the Mediterranean, who all deemed it necessary to have an assembly of the elder citizens of the state, besides a popular assembly. Under Tarquinius Priscus, the number of senators was increased to 300, each of the 300 houses (*gentes*), which composed the three tribes, having its *decurio,* or representative head, in the Senate. Subsequently, the election of the senators was made by the censor reading aloud once in every luster (five years) the names of the senators, the worthiest first; the one first named being styled *princeps senatus.* Those who were deemed unworthy of the dignity were degraded by the omission of their names. The senators were chiefly drawn from the ranks of the equestrian order. In the days of the republic, a senator was required to possess property to the value of about $22,500, and in the days of Augustus of about $32,500. The Senate was assembled by the supreme officers of government, deciding the propositions laid before it, article by article, by a majority of voices. A decree of the Senate was called *senatus consultum.* If the decree was opposed by the tribune, or if the Senate was not full, the act was termed *senatus auctoritas,* and was submitted to the people, whose tribunes could reject every proposition by their vote. The Senate had within its jurisdiction all matters of public administration, questions of peace or war, the choice of public officers, and the financial concerns of the republic. Under the empire, the Senate gradually lost its political consideration, but till the time of Constantine the Great many of its decrees took the place of the laws enacted by the people. In the end, it became so submissive to the will of the emperor, that it often decided on the propositions of the ruler without deliberation and with acclamation.

In France the upper legislative chamber under Napoleon I., and Napoleon III., was called the Senate, and the name is still in use in the French republic. The Senate is composed of 300 members, of which 75 formerly held their seats for life, but after 1884 vacancies in life senatorships were filled by department elections. The seats are divided by lot into three classes, one class going out at successive periods of three years.

Senate, United States, the higher branch of Congress; composed of two senators from each State, irrespective of the population therein, who are elected by the State Legislatures. Some of the most important functions of the Senate, as distinct from the House, are the supervision of the presidential appointments of the highest grade of public officers, the passing of judgment on all treaties contracted with foreign powers, and the sole power to try all impeachments. In the latter case impeachment proceedings must originate in the House, which presents the charges to the Senate; this, in turn, acts as the court. The Vice-President of the United States is pres-

ident of the Senate, but has no vote therein excepting in the case of a tie, and is really an officer with very limited power. It is customary after the Vice-President has been installed as presiding officer of the Senate, for him to preside over a few sessions of that body and then ask for a leave of absence, when the Senate elects one of its own members as president *pro tem.*, and the member so chosen acts as presiding officer whenever the Vice-President does not wish to exercise that privilege. In the 62d Congress (March 4, 1911-March 4, 1913), there were 92 senators, of whom 50 were Republicans and 42 Democrats. The president *pro tem.* was William P. Frye, of Maine, first elected in 1896. See CONGRESS.

Seneca, a lake in the W. part of New York State; 25 miles S. of Lake Ontario, into which its waters flow. It is about 37 miles long, from 2 to 4 miles broad, and 630 feet deep. It communicates with the Erie canal, and steamers ply on it.

Seneca, Lucius Annæus, a Roman philosopher, son of M. Annæus Seneca, an eminent rhetorician; was born in Corduba, Spain, about the beginning of the Christian era. Taken early to Rome, he became an advocate, gained some distinction, and was made quæstor. But under Claudius, an accusation brought against him by the infamous Messalina, led to his being banished to Corsica. Returning after an exile of eight years, he was intrusted by Agrippina with the education of her son Nero. He acquired over the youth an influence as strong as it was salutary, and, having already at Agrippina's instance become prætor, he was, at that of Nero (now emperor), made consul, A. D. 57. His high moral aims and intellectual gifts incurred the aversion of the emperor, who at length came to regard him with jealousy and hatred. His wealth, accumulated under Nero's profligate extravagance, excited the rapacity of the latter. An attempt on Nero's part to poison him having failed, he was drawn into the Pisonian conspiracy, accused, convicted, and condemned. Left free to choose his mode of death, he opened his veins, and gradually succumbed to syncope, A. D. 65. His second wife, Pompeia Paullina, who wished to die with him, and actually had her own veins incised for the purpose, survived him a few years. His writings were very numerous, and many are still extant; among them are treatises on "Anger"; on "Consolation"; on "Providence"; on "Tranquillity of Mind"; "The Blessed Life"; 124 letters to Lucilius; 10 tragedies, and a remarkable work entitled "Speculations on Natural Phenomena." Seneca attached himself chiefly to the Stoic school but adopted also principles from other systems. His works abound in quotable maxims and sentiments.

Seneca, Marcus Annæus, a Roman rhetorician; father of the preceding; a native of Corduba, in Spain; born about 61 B. C. He went to Rome during the reign of Augustus, and there taught rhetoric with great success for several years. He died in Rome toward the close of the reign of Tiberius (A. D. 37). He was the author of a collection of extracts showing the treatment of school themes by contemporary rhetoricians, but of no importance as literature.

Seneca Falls, a village in Seneca co., N. Y.; on the Seneca river, near Cayuga Lake, and on the New York Central and Hudson River railroad; 16 miles N. of Auburn. It contains a public library, Mynderse Academy, the Convent of St. Patrick, National and other banks, and several newspapers. The river here falls 50 feet and furnishes motive power for flouring, woolen and knitting mills, foundries, and manufactories of steam fire engines, pumps, and agricultural implements. The assessed property valuation is over $3,500,000. Pop. (1900) 7,305; (1910) 6,588.

Seneca Indians, a tribe of North American Indians belonging to the Iroquois, and formerly occupying Western New York and a portion of Northwestern Pennsylvania. They were once powerful; and their most famous chief was Sagoyewatha, or "Red Jacket." They now occupy reservations in Kansas.

Seneca River, a river of New York State; flows E. from the N. end of Seneca Lake to the N. end of Lake Cayuga, then turns N. and is joined on the left by the outlet of Lake Canandaigua, then turns again E., and receives in succession the drainage of the other parallel "finger lakes" to the E. (Owasco, Skaneateles, and Onondaga), then turns N. W., taking the name of Oswego river, and enters Lake Ontario at Oswego. Length (including the Oswego) nearly 100 miles.

Senecio, the groundsel, a genus of plants, order *Asteraceæ*, remarkable as being probably the most extensive in point of species in the whole vegetable kingdom. They are spread over all parts of the globe, nearly 900 different kinds being known to botanists. The groundsel (*Senecio vulgaris*) and the ragwort (*S. Jacobæa*), afford a good idea of the appearance of the European species, the most noteworthy of which is, perhaps, the well-known *S. cineraria*, better known in gardens as *Cineraria maritima*, extensively used for planting in flower beds for the sake of contrast with scarlet and other colors, its beautiful foliage being clothed with short white down. The golden senecio, *S. aureus*, an American species found in all the States, in meadows, woods, etc., is a handsome plant, with golden-yel-

low flowers; stem 1–2 feet high, single or branched above, terminating in a kind of umbellate, single or compound corymb.

Senefelder, Aloys, the inventor of lithography; born in Prague, Bohemia, Nov. 6, 1771; died in Munich, Bavaria, Feb. 26, 1834. See LITHOGRAPHY.

Senega, or **Seneka,** the dried root of *Polygala senega,* the rattlesnake root. It is stimulant, expectorant, diuretic, and emmenagogue, and in large doses, emetic and cathartic. It is given in chronic affections of the lungs, in functional derangement of the heart, in dropsy, amenorrhœa, and dysmenorrhœa.

Senegal, a river of Western Africa, which rises in the interior not far from some of the Niger sources, and after a course of some 1,000 miles falls into the Atlantic near lat. 16° N. It is navigable for flat-bottomed boats, for about 740 miles from its mouth, as far as the cataracts of Félou, and for steamers (during certain months) about 650 miles. Its volume approaching the coast is greatly reduced by numerous *marigots* or channels which divert its waters through the adjacent plains, and its mouth is dangerously barred at certain seasons.

Senegal, or **French Senegambia,** a French colony; between the Sahara and the Gambia river; extends from the Atlantic on the W. to the French Sudan on the E.; area, about 80,000 square miles. The name Senegambia, which is not used by the French, has been applied to this region, being compounded from the names of the rivers, Senegal and Gambia, between which it lies. Gold, silver, copper, and quicksilver are found. Much of the soil is rich. The natives cultivate millet, maize, and rice; other products are gums, castor-beans, ground nuts (30,000 tons annually), cocoanuts, rubber, and kola. The domestic animals comprise about 90,000 cattle, 50,000 sheep, 40,000 goats, and 30,000 camels. The native industries are weaving and the making of bricks, pottery, and jewelry. A railway connects the coast towns of Dakar and St. Louis. Another line was begun in 1899, running from Kayes on the coast, toward the Upper Niger. In 1898 there were 574 miles of telegraph lines in the colony.

Government.— For administrative purposes the colony is divided into four communes; St. Louis (the capital and residence of the governor of West Africa), Dakar, Goree, and Rufisque; nine circles; various countries directly under the French protection; and self-governing states which have accepted the French protectorate. In October, 1899, a portion of the West Sudan was placed under the same administration as Senegal. The expenditures of France in Senegal in 1900 was 5,686,205 francs ($1,137,241).

History.— The French first settled Senegal in 1637. It was taken by the English in 1756, retaken by the French in 1779, and subsequently held by the English till the peace of 1814. The settlements languished till the appointment of General Faidherbe as governor in 1854. He began a most vigorous line of action, subdued the Berber chiefs who prevented the French advance inland, and annexed their territories. This policy was pursued in the same spirit by subsequent governors; districts were annexed and protectorates proclaimed with extraordinary celerity, though the two powerful chiefs Ahmadou and Samory occasioned them a great deal of trouble, 1887–1890. Pop. about 1,180,000.

Senegal Jackal, a well-marked variety of the jackal (*Canis aureus*), to which specific distinction is sometimes given as *Canis anthus.* It is larger than the common kind, more elegantly built, and has long legs, somewhat like a greyhound. Color bright tawny, with a black band on back, chest, and sides.

Senegambia. See SENEGAL.

Seneschal, in the Middle Ages, an officer in the house of princes and high dignitaries, who had the superintendence of feasts and domestic ceremonies; a steward. In some instances he had the dispensing of justice.

Senior, Nassau William, an English political economist; born in Compton, England, Sept. 26, 1790. He graduated at Oxford in 1814, and in 1819 was called to the bar at Lincoln's Inn. In 1825 he was appointed to fill the newly constituted chair of political economy at Oxford. This he resigned in 1830, but was reappointed in 1847. He wrote: "An Outline of the Science of Political Economy" (London, 1836); "Political Economy" (London, 1850); "Essays on Fiction" (London, 1864); a collection of articles on Scott, Thackeray, and others; and "Historical and Philosophical Essays (2 vols. London, 1865). He died in Kensington, London, June 4, 1864.

Senior, William, an English journalist; special correspondent of the "Daily News." He wrote: "Notable Shipwrecks" (1873); "Waterside Sketches: A Book for Wanderers and Anglers" (1875); "By Stream and Sea" (1877); "Travel and Trout in the Antipodes" (1879); "Angling in Great Britain" (1883); "Near and Far" (1888); "The Thames from Oxford to the Tower" (1889); "A Mixed Bag" (1895).

Senlis, an ancient town of France; in the department of Oise; 33 miles N N. E. of Paris. Its older portion is surrounded by walls, flanked with towers, which date from Roman times. The cathedral, a small

edifice, with a striking bell tower, is a beautiful example of early Gothic (begun in 1155); Senlis ceased to be a bishop's seat in 1801. Here was signed on May 23, 1493, a treaty between Charles VIII. of France and the Emperor Maximilian I. There still exist the ruins of an old royal castle. Pop. 7,111.

Senn, Nicholas, an American surgeon; born in Buchs, Switzerland, Oct. 31, 1844; removed with his parents to Ashford, Wis., in 1853; was graduated at the Chicago Medical College in 1868; followed his profession in Fond du Lac, Wis., in 1869–1874, and removed to Milwaukee, Wis., in 1874. In 1885 became a professor in the College of Physicians and Surgeons, Chicago; Professor of the Principles of Surgery and Surgical Pathology in Rush Medical College in 1888, and removed to Chicago in 1891. He was made surgeon-general of Wisconsin before his removal, and served in the field during the American-Spanish War. His publications include "Experimental Surgery"; "Surgical Bacteriology"; "Intestinal Surgery"; "Pathology and Surgical Treatment of Tumors"; "Tuberculosis of Bones and Joints"; "Tuberculosis of the Genito-Urinary Organs"; "Medico-Surgical Aspects of the American-Spanish War"; etc. Died Jan. 2, 1908.

Senna, in botany, various species of cassia. The leaf of *C. elongata* constitutes Tinnevelly senna. Other Indian species furnishing the drug are *C. obovata, C. lanceolata,* and *C. absus.* Alexandrian or Nubian senna is the leaf of *C. lanceolata* and *C. obovata.* It is often adulterated, accidentally or intentionally, with the bladder senna (*Colutea arborescens*), as other kinds sometimes are with *Solenostemma argel,* which is bitter and irritating. Tripoli senna is from *C. æthiopica;* and that of Chile from *Myoschilos oblongus.* A confection, a compound mixture, a tincture, and a syrup of senna are employed in pharmacy. Senna is a somewhat potent purgative, but is apt to gripe unless combined with salines, like Epsom salts, or tartrate of potash and some aromatic.

SENNA: CASSIA OBOVATA.

Sennaar. See SENAAR.

Sennacherib, an Assyrian king, son of Sargon, whom he succeeded 705 B. C. He suppressed the revolt of Babylonia, and marched against the Aramæan tribes on the Tigris and Euphrates, of whom he took 200,000 captive. He then reduced part of Media; rendered tributary Tyre, Aradus, and other Phœnician cities; advanced on Philistia and Egypt, and finally proceeded against Hezekiah, King of Judah, who had revolted. Yielding to panic, Hezekiah paid the tribute exacted of 300 talents of silver and 30 talents of gold. On his return to Assyria Sennacherib again attacked Babylonia and afterward reinvaded Judah. Having marched through Palestine he besieged Libnah and Lachish, and wrote a threatening letter to Hezekiah; but in consequence of a miraculous visitation, which caused the death of 185,000 of his troops, Sennacherib returned to Nineveh and troubled Judah no more. His own account of this campaign has been discovered, and it acknowledges his failure. From Herodotus we learn an Egyptian tradition regarding the destruction of Sennacherib's host, but no mention of it is found in the monuments of Sennacherib. The greatest architectural work of Sennacherib was the palace of Koyunjik, which covered fully eight acres. He was murdered by his own sons Adrammelech and Sharezer, 681 B. C.

Senones (sĕn′ō-nēz), an ancient tribe of Gauls, who were settled on the river Yonne. The chief town of this tribe was the Sens of today.

Sensation, the change in consciousness which results from the transmission of nervous impulses to the brain. Such impulses may be generated within the nerves themselves (but only in diseased conditions), or may be produced by stimuli applied to such parts of the body as are provided with nerves. Such nerves are often styled sensory or afferent. It must be remembered, however, that afferent impulses are constantly being carried to the brain from all parts of the body, resulting in motor and other acts necessary to our life, without exciting any sensation at all. It is through our sensations that we gain our knowledge of the external world, and of the state of our body. The means by which these are produced are the elaborate nervous mechanisms developed in connection with the various senses of smell, sight, hearing, taste, touch, temperature (or heat and cold), pain

or general sensibility, the muscular sense, and those of hunger and thirst. The rate of transmission of nervous impulses is a subject to which increasing attention is paid by psycho-physiological investigators, and laboratory experiments in that line are being conducted in many European and American universities. For each special sense there is a particular nerve center (see BRAIN); and each special sense has its own peculiar end organ; the special endings of the olfactory nerves in the upper part of the septum of the nose for that of smell; the retina in the eyeball for sight; the rods of Corti in the cochlea for hearing; the taste bulbs and the fibrils in the fungiform papillæ in the tongue for taste; and the Pacinian corpuscles and the special ramifications of the cutaneous nerves in the epidermis for touch. The integrity of these and of the special non-nervous apparatus with which they are connected is necessary for the production of a sensation. Thus, the transparent media of the eyeball, and the rods and cones of the retina are all essential to the production of a visual sensation. In proportion as they are abnormal, the sensation is imperfect. Further, each end organ can be thrown into action only by certain kinds of stimuli, and the nerves in connection with them convey those impulses only which give rise to their own special varieties of sensation. The retina can only be stimulated by waves of light, never by those of sound, and the optic nerve if stimulated directly can give rise to visual sensations only. This law holds good also for the cutaneous nerves, there being reason to believe that the end organs for touch are not the same as those for temperature. It is probable even that there are separate nerves for the perception of heat and of cold. All parts of the end organs are not equally sensitive or capable of being similarly affected by the same kind of stimulus. Thus, the same substance may appear sweet at the anterior part and bitter at the posterior part of the tongue. The retina is most sensitive at the yellow spot, while the various colors are perceived over areas which differ considerably. Tactile sensibility varies exceedingly. The points of a compass can be felt as double at a distance of about $\frac{1}{25}$ part of an inch at the tip of the tongue, of $\frac{2}{25}$ of an inch on the front of the tip of the forefinger, but only at a distance of more than 2½ inches on the back.

The muscular sense is that by which we are made aware of the position of any part of the body, by which we gauge the amount of movement necessary to affect any object or to overcome any resistance. Many authorities deny the existence of such a special sense altogether, and believe that it is merely a form of ordinary tactile sense. But that this is not so is frequently illustrated in a disease of the spinal cord, locomotor ataxia, in which there is, when the eyes are shut, a more or less complete absence of knowledge of the position of the limbs and of the power of regulating their movements, though the cutaneous tactile sensibility may be quite normal. It would appear likely that the nerve endings connected with this sense are situated in the muscles, tendons, and joints, and that these are stimulated by changes in movement and mutual pressure in these structures.

The sensation of pain (or general sensibility) is produced when pressure on a part, or when the temperature of a body applied, exceeds certain limits. What was at first a sensation of touch, or of heat or cold, becomes replaced by a painful sensation. It is very difficult to be certain whether there are special end organs for the reception of such impressions. The olfactory, optic, auditory, and gustatory nerves do not transmit painful impressions, and it might be supposed that the analogy would hold in the case of the senses of touch and temperature. It is found in some cases of disease that the prick of a pin may be felt as a touch one or two seconds before it becomes painful. But this is open to the explanation that the delay in the latter case may take place in the spinal cord owing to a different path of conduction rather than to a difference in the time that it takes to stimulate the end organ. Painful sensations may result from excessive stimulation of a sensory nerve at any part of its course, which would seem to point in favor of the non-existence of special end organs. With regard to the paths by which these various impulses reach the brain, we know (if we except the fifth cranial and the vagus nerves) that they reach the spinal cord by the posterior roots of the spinal nerves, and that those impulses which produce tactile, thermal, and painful sensations for the most part (though this has recently been questioned) travel up the side of the cord opposite to that at which they entered, but their exact course is not certainly determined. The path for the muscular sense-impulses is by many regarded as lying in the posterior columns of the same side (see SPINAL CORD).

Within the medulla oblongata the obscurity as to the upward sensory conducting tracts is even greater than in the cord, not only in the case of the senses above mentioned, but also of the sense of hearing and taste. It is probable that the paths are not continuous, but are frequently interrupted by nerve cells, through the agency of which the nervous impulses undergo successive elaborations before reaching the cerebral cortex. See NERVE.

Sensationalism, in philosophy, the doctrine that knowledge is the outcome of sen-

sation, that psychology is a branch of the wider science of biology, and mind but one aspect of life. This teaching flourished, chiefly in France in the 18th century, whence sensationalism is sometimes called 18th century philosophy. Its precursor was Hobbes, whom Condillac (1715–1780) followed and amplified, attributing a sensuous origin to faculties as well as to ideas. Hartley (1705–1757) and Erasmus Darwin (1731–1802) in England and de Tracy (1754–1836) and Cabanis (1757–1808) in France also endeavored to establish a physiological basis for mental phenomena.

Sense Riddles. See RIDDLES.

Senses. See EYE: EAR: NOSE: SMELL: TOUCH: etc.; also NERVE: SENSATION: etc.

Sensitive Flames, flames which quiver and are sometimes extinguished when a musical note of a certain pitch is sounded.

Sensitive Plants, the *Mimosa pudica* and *M. sensitiva*, which possess a vegetable irritability, causing them to shrink from the touch. If the fingers be applied to one of them, the leaflets of the bipinnate leaf over-lap one another from below upward; if greater irritation be applied, the secondary petioles bending forward approach one another, and if the irritation be still increased, the common petiole sinks down by bending at the joint uniting it with the stem. Most mimosas and some other leguminous plants with compound leaves are partially sensitive; so are various *Oxalidaceæ*, specially *Averrhoa bilimbi*, *Oxalis sensitiva* and *O. stricta*. Of other orders, Venus' flytrap, *Dionœa muscipula*, is sensitive; as is, to a less extent, *Barbarea vulgaris*, the common barberry.

Sensitometer, in photography, an apparatus for testing the sensitiveness of photographic preparations. One form consists of a screen, divided into small squares of varying opacity, which is placed before the surface to be tested, and the whole exposed to a standard light for a fixed time. Each square of the screen bears a number, and the higher the number impressed on the sensitive surface, the more sensitive it is.

Sensorium. It was long attempted to determine some one point in the brain where the soul is more especially located or centralized; and to this ideal point the name of sensorium was applied in the elder psychological speculations. The fancy of Descartes made it a small body near the base of the brain, called the "pineal gland." The recent views of the nervous system repudiate the idea of a central point of this nature; in consciousness, the brain generally is active, although, under different impressions and ideas, the currents may be presumed to follow different nerve-tracks. Consequently, no meaning is now attached to a sensorium in psychology, as distinct from the cerebrum at large. The term is actually applied by physiologists to a series of ganglionic centers, each of which has the power of communicating to the mind the impressions derived from the organ with which it is connected, and of exciting automatic or involuntary muscular movements in respondence to these sensations.

Sentence, in law, a judgment pronounced by a court or judge on a criminal; a judicial decision publicly and officially declared in a criminal prosecution. In grammar, a sentence is the form of words in which a thought or a proposition is expressed. A mere phrase or group of words, such as, "A very high mountain," which only conveys a meaning or calls up an idea, but does not make an affirmation, is not a sentence. Since speech is the expression of thought, the sentence is the proper unit or integer of speech, and thus forms the starting point in the study of language. Every single sentence is made up of two parts — the one naming the subject or the something that is spoken about; the other the predicate, or the something that is said of it; as, "The sun — shines"; "Those who have the greatest gifts, and are of the greatest usefulness — are the most humble." Every sentence must contain a finite verb, as it is the function of the verb to make affirmations. "The sun shines," is an example of a sentence in its barest form, containing merely the subject "sun," and the predicate "shines," which are called the principal elements. The enlargement or development of the sentence takes place by means of adjuncts, or secondary elements in the form of modifiers or complements of the principal elements; as "Young birds build nests without experience."

Sentinel, or **Sentry,** a private soldier, marine, or sailor posted at a point of trust, with the duty of watching the approach of an enemy or any person suspected of hostile intentions. Sentries mount guard over depots of arms, the tents of commanding officers, etc. During the night each sentry is instructed with the "word," or "countersign"; and no person, however exalted in position, may attempt to approach or pass him without giving that as a signal. In such case the sentry is bound to arrest the intruder, and, if necessary, to shoot him. When an army is in the field the pickets guard the approaches in every direction some distance in front of the main body of troops. In the event of an attack they give the alarm, and retire slowly on their supports.

Sentinel Crab, in zoölogy, *Podophthalmus vigil*, two to four inches long, from the Indian Ocean. The eyes are set on long footstalks, which, when the animal is alarmed, are erected so as to command an extensive view.

Seoul, the capital of Korea; on the Han river, 75 miles from its entrance into the Yellow Sea, and 57 miles from its port Chemulpo, with which it has been connected by rail since July, 1900. It lies in a natural basin, among granite hill ranges, and is surrounded with walls. The streets are very narrow and very dirty, and the houses beggarly in the extreme. The city includes several wide, desolate squares. The royal palace and its adjuncts cover 600 acres of ground. Silk, paper, tobacco, mats, fans, and similar commodities are the principal products of native industry. There are schools for the teaching of Japanese, French, Chinese, Korean, Russian, and English, and an American Mission School, which is subsidized. All but the last-named are under the Educational Department. Prior to the war between Russia and Japan in 1904, foreign marines were sent there to protect their several legations. Pop. (1902) 196,646; including extensive suburbs, 300,000.

Sepal, in botany, the segments, divisions, or leaves of a calyx. The term was first used by Necker, revived by De Candolle, and now universally accepted. If there is but one sepal, *i. e.,* if the sepals have adhered by their sides, the calyx is said to be monosepalous or gamosepalous; if two, disepalous; if three, trisepalous; if four, tetrasepalous; but the last three terms are rare.

Separating Power, a quality of the object glass of a telescope, which depends on its aperture, supposing that it is otherwise perfectly corrected so as to bring the cone of rays which proceed from a point as nearly as possible to a point in the focal plane; yet the image cannot be an exact point, but, necessarily from the wave theory of light, the image of a point must be a small disk, and the size of this disk varies inversely as the aperture of the telescope. In a 1-inch glass the size of the disk is about 4.5 inches; in a 4.5-inch glass 1 inch; in a 9-inch glass .5 inches, etc. This limits the closeness of double stars or similar objects which a glass will separate or show double, hence the term, separating power.

Separatist, a small sect calling themselves Separatists or Protestant Separatists, and holding aloof from the Church of England, believing it not sufficiently to maintain its Protestant character.

Sepia, in zoölogy, the typical and only recent genus of *Sepiadæ;* body oblong (varying in length from 3 to 28 inches), with lateral fins as long as itself; arms with four rows of suckers; mantle supported by tubercles fitting into sockets on neck and funnel; shell broad and thick in front, laminated, and terminating in a permanent mucro. Woodward puts the species at 30, universally distributed. In palæontology; fossil species 10, from the Jurassic to the Eocene Tertiary. Several species have been based on mucrones from the London Clay. In comparative anatomy; the black secretion of the cuttlefish. In chemistry and art; a dark brown pigment prepared from the black secretion of the cuttlefish, *S. officinalis.* The pigment may be isolated by boiling the secretion successively with water, hydrochloric acid, and ammonium carbonate. It is tasteless, inodorous, insoluble in water, alcohol, and ether, but dissolves in warm caustic potash. When the latter is decomposed with acid, the sepia pigment is precipitated of a dark brown color, and having a fine grain.

Sepiadæ, the cuttlefish family, comprising cephalopods whose calcareous internal shell or cuttle bone consists of a broad laminated plate, terminating behind in a hollow imperfectly chambered apex. They are distributed world-wide, and are from three inches to three feet long. The best known species is *Sepia officinalis,* the common or officinal cuttlefish. Its body is somewhat oval, but broader at the head than at the extremity, which is obtusely pointed. The head is furnished with eight arms and two feet, the latter being nearly similar in structure to the arms or tentacula, but considerably longer in their dimensions. A neck divides the head from the body, which is furnished on each side throughout its entire length with a narrow fin. The back is strengthened by a calcareous plate, well known as the cuttlefish bone. This bone was in former times in great repute among apothecaries as an absorbent; but now it is chiefly used in the form of a powder, to polish the softer metals. The term bone, however, is properly inapplicable to the calcareous shield of the cuttlefish, as in its composition it is exactly similar to shell, and consists of various membranes hardened by carbonate of lime, without the smallest mixture of phosphate: It is also termed the ink fish. Beneath its throat is a bladder, in which is secreted a black fluid, and which, when pursued, it ejects, so staining the water that it easily escapes. It has the chameleon-like power of changing its color.

Sepiola, in zoölogy, a genus of the *Teuthidæ,* with seven species, from the coasts of Norway, Great Britain, the Mediterranean, Mauritius, Japan, and Australia. Body short, purse-like; mantle supported by a broad cervical band, and a ridge fitting a grove in the funnel; fins dorsal; suckers in two rows, or crowded, on arms, in four rows on tentacles; first left arm hectocotylized; pen half as long as the back.

Sepioteuthis, a genus of *Teuthidæ;* with 13 species, distributed from the West Indies to the Cape, the Red Sea, Java, and Australia. Closely akin to the loligo; fins lateral, as long as the body; length from four

inches to three feet; fourth left arm hectocotylized at apex.

Sepometer, in physics, an instrument for determining, by means of the decoloration and decomposition produced in permanganate of soda, the amount of organic impurity existing in the atmosphere.

Sepoy, a slight alteration of the ordinary word used for centuries by the natives of India for a soldier in general, but confined by Anglo-Indians to the Hindu and Mohammedan troops, especially to those in British pay. The French, under Labourdonnais, set the example of employing sepoys at the siege of Madras in 1746. Next year, sepoys, probably undisciplined peons or policemen, fought on the British side; and in 1748 a small corps of sepoys was raised. As the three presidencies were established and developed, each trained sepoys, till at length there arose three great armies, which largely aided Great Britain in establishing its Indian empire. The battle of Inkerman (Nov. 5, 1854) having shown the superiority of the Minie rifle to the old musket, the British desired to place the Enfield, an improvement on the Minie, in the hands of the native soldiery. Unhappily for the British the cartridges manufactured in England were made up with cows' grease, which, by the Hindu ceremonial law, was fatal to the caste of any one putting them to his lips. The cry arose that this was done intentionally, all explanations to the contrary were rejected, and on Sunday, May 10, 1857, the troops stationed at Meerut broke into open mutiny, attended by a massacre of Europeans. The mutineers escaped to Delhi, where a fresh massacre took place. The restoration of the Mogul empire was proclaimed, and the Bengal sepoy mutiny became strengthened by a Mohammedan rebellion. Regiment after regiment of the Bengal army mutinied, till nearly all had deserted their colors, and a death struggle took place during the next two years between the handful of Europeans in Upper India and Bengal and those who sought their lives. Delhi was retaken, after desperate fighting, between the 14th and 20th of September, 1857; Lucknow reinforced on Nov. 16, 1857, and relieved in March, 1858. The disproportion between sepoys and European soldiers, which had been very great at the outbreak of the mutiny, was reduced at once by a large diminution of the former and a great increase of the latter. Immediately before the mutiny the number of European officers was 6,170, of soldiers 39,352, and of natives 232,224 — total 277,746. In 1882–1883 the Bengal army numbered 105,270 officers and men, of whom 66,081 were native troops; the Madras army 46,309, of whom 34,283 were natives; and the Bombay army 38,897, of whom 27,041 were natives. The total British army in India in 1898 consisted of 214,928 officers and men, of whom 74,288 were Europeans and 140,640 natives.

Septaria, ovate, flattened nodules of argillaceous limestone or ironstone, internally divided into numerous angular fragments by reticulating fissures which radiate from the center to the circumference, and are filled with some mineral substance, as carbonate of lime or sulphate of barytes, that has been infiltrated subsequent to their formation. The fissures have been produced by the cracking of the nodule when drying. They are largest and most numerous in the center, and gradually decrease outward, showing that the external crust had first become indurated, and so, preventing any alteration in the size of the whole mass, produced wider rents as the interior contracted. The radiating figure and the striking contrast between the dark body of argillaceous limestone or ironstone and the more or less transparent sparry veins when the nodule is cut and polished have caused them to be manufactured into small tables and similar objects.

Calcareous septarian nodules are extensively employed in the manufacture of cement. As they are composed of clay, lime, and iron, they form a cement which hardens under water, and which is known commercially as Roman cement, because of its properties being the same as a famous hydraulic cement made of ferruginous volcanic ash brought from Rome. Such septaria occur in layers in clay deposits, and are quarried for economical purposes in the clays of the London basin. Large numbers are also dredged up off Harwich, which have been washed out of the shore cliffs by the waves.

The septarian nodules of the Carboniferous strata consist generally of clay ironstone, and are sometimes employed in the manufacture of iron. The nodules generally contain a scale, shell, plant, fruit, coprolite, or some other organic substance, forming the nucleus that has apparently excited the metamorphic action which withdrew from the surrounding clay the calcareous and ferruginous materials scattered through it, and aggregated them around the fossil.

September (from the Latin *septem,* seven), the ninth month of our year, but the seventh of the old Roman year, which began in March. It has always contained 30 days.

Septembrists, in French history, the name given to the agents in the massacre which took place in Paris on Sept. 2, 1792, during the French Revolution. The numbers that perished in this massacre have been variously given; but the term has become proverbial throughout Europe for all that is bloodthirsty and malignant in human nature.

Septennate, The, a term of seven years. In the German parliamentary elections of 1887 the struggle centered around the septennate. On Jan. 14 the emperor dissolved the Reichstag and ordered new elections to take place. The government had proposed the addition of 40,000 men to the standing army, and sanctioned the maintenance of the present military force for another septennate. No previous army grant had been for more than two years. Prince Bismarck favored the measure. The emperor said, "The septennate means peace. Reject it and there will be war." But the delegates voted the supplies for three years only, and the chancellor, by a decree from the throne, dissolved the house. The government secured a majority of about 40 votes in the general election, Feb. 1, 1887, and on March 11 the new Reichstag passed the septennate bill.

Sept-foil, in the Roman Catholic Church, a typical figure composed of seven equal segments of a circle, used to denote the number of the sacraments, gifts of the Holy Ghost, etc.

Septicæmia, or **Septæmia,** in pathology, a state of the blood without secondary abscesses, a kind of pyæmia with intense fever, and great constitutional disturbance from blood poisoning. The anti-septic researches of Lister and of Pasteur have done much to counteract septicæmia.

Septuagesima, the third Sunday before Lent, so called because it is about 70 days before Easter.

Septuagint, a Greek version of the Hebrew or Old Testament Scriptures; the oldest one made into any language. A still extant letter referred to by Josephus, Jerome, and Eusebius, purports to be from a certain Aristeas, officer at the court of Ptolemy Philadelphus. It states that after the king had founded the great Alexandrian library, he wished to have a copy of the Jewish sacred books. By the advice of his chief librarian, Demetrius Phalareus, he sent to the high priest at Jerusalem, requesting him to send six translators from each tribe, 72 in all. The request was complied with; the translators came and completed their work in 72 days. From their number, and perhaps the time they occupied, the name Septuagint arose. But the letter of Aristeas is not now believed to be genuine, and Coptic words in the work show that the translators were from Egypt, and not from Jerusalem. The version was apparently made at Alexandria, and was commenced about 280 B. C., the Pentateuch being the only part translated at first. It is well done. Next in value is the book of Proverbs. Job was translated from the Hebrew text, differing both by excess and defect from that now recognized. Esther, the Psalms, and the Prophets followed, seemingly between 180 and 170 B. C. Jeremiah is the best translated, and Daniel is executed so badly that Theodotion, in the 2d century A. D., had to do the work again. Jesus and His Apostles frequently quoted the Septuagint in place of the Hebrew. The Jews had a high opinion of the Septuagint, but on finding the Messianic passages used effectively by the Christians in controversy with them, they established a fast to mourn that the Septuagint had ever been issued, and had a new translation by Aquila brought out for the use of the synagogues. Three Christian recensions took place late in the 3rd or early in the 4th century. The first modern edition was the Complutensian in 1514–1517; since then several others have appeared.

Sepulveda, Juan Gines, a Spanish historian; born in Pozo-blanco, near Cordova, Spain, about 1490; studied first at Cordova and Alcala de Henares, and went to Bologna in 1515, where and at Rome he became acquainted with the most celebrated savants of Italy and Spain. In 1536 he returned to Spain as historiographer to Charles V. and preceptor to his son, afterward Philip II. After living successively in Valladolid, Cordova, and Madrid, he was made a canon of Salamanca. He won a reputation as the champion of humanism against the prevailing scholasticism. His principal work is entitled "History of Charles V.," published with a biography and Sepulveda's other works by the Madrid Academy in four volumes in 1780. His other works include a "Life of Albornoz," a "History of the Reign of Philip II.," and a "History of Spain in the New World." He died in Salamanca, Spain, Nov. 23, 1574.

Sequence, a series of things following in a certain order or succession; specifically, a set of cards immediately following each other in the same suit, as an ace, two, three and four. In music, the recurrence of a harmonic progression or melodic figure at a different pitch or in a different key to that in which it was first given. A tonal or diatonic sequence is when no modulation takes place. A chromatic or real sequence takes place when the recurrence of a phrase at an exact interval causes a change of key. In the Roman ritual, a rhythm sometimes sung between the Epistle and the Gospel. At first it was merely a prolongation of the last note of the Alleluia, but afterward appropriate words were substituted. When the Roman Missal was revised in the 16th century, only four of the existing sequences were retained: *Vietimæ Pasehali*, for Easter; *Veni, Sanete Spiritus*, for Pentecost; *Lauda, Sion*, for Corpus Christi; and the *Dies Iræ*, for Masses of the Dead. The *Stabat Mater*, for the Feast of the Seven Dolors, is of later date.

Sequestration, in law: (1) The separation of a thing in controversy from the

possession of those who contend for it. (2) The setting apart the goods and chattels of a deceased person to whom no one was willing to take out administration. (3) A writ directed by a Court of Chancery to commissioners, commanding them to enter the lands and seize the goods of the person against whom it is directed. It may be issued against a defendant who is in contempt by reason of neglect or refusal to appear or answer or to obey a decree of court. (4) The seizure of the property of an individual for the use of the State; particularly applied to the seizure by a belligerent power of debts due by its subjects to the enemy.

Sequin, a gold coin, first struck at Venice about the end of the 13th century. In value it was worth from $2.00 to $2.27.

Sequoia. See BIG TREES.

Seraglio, the palace of the Sultan, occupying a point of land between the Golden Horn and the Sea of Marmora, and forming the E. portion of the city of Constantinople. It is surrounded by walls nearly 3 miles in circuit, and contains government buildings (divan, treasury, hall of justice, arsenal, mint, etc.), mosques, gardens, baths, as well as the Sultan's harem (Arabian, "sacred place"), which occupies its inner enclosure, and consists of a group of houses and gardens, each occupied by one of the Sultan's wives. The court of the harem is guarded by the black eunuchs, under their chief, the kislar aga. The gate of the outer court forms a sort of pavilion, from which the Turkish government takes its name of "the Sublime Porte." With the exception of the harem, the seraglio may be visited by strangers. It has accommodation for 20,000 persons, though it never contains that number.

Seraing, a town of Belgium; 4 miles S. W. of Liege, on the Meuse, and connected by a handsome suspension bridge with the village of Jemeppe. It is the seat of a colossal manufactory of steam machinery, locomotives, etc., which was established in 1817 in the old summer palace of the bishops of Liege. It now employs some 12,000 work people in hundreds of machine shops, furnace yards, forges, boiler works, coal mines, and other branches. In this establishment were made the first locomotive used on the Continent (1835), the machinery for boring the Mont Cenis tunnel, and the great lion on the field of Waterloo. Pop. (1906) 40,488.

Serajevo. See BOSNI-SERAI.

Serajgunge (Serajganj), a town in the district of Pubna, Bengal, British India; on the Brahmaputra river (or Jamuna as it is here called); 153 miles N. E. of Calcutta. The houses are 6 miles from the low water channel of the river, separated by a sandy plain, and the river landing-places shift every flood season. Serajgunge was founded about the beginning of the 19th century, and is now the chief river-mart in Bengal, having risen with the growth of the jute trade. It collects jute, rice, oilseeds, tobacco, etc., from all the neighboring districts for dispatch to Calcutta, and distributes piece-goods, salt, sugar, iron, hardware, etc. The trade is entirely water borne. The steamers of the East Bengal Railway Company carry away about 50,000 tons of jute annually, and native boats nearly twice as much. The branch of the Bank of Bengal requires $2,000,000 a year in coin to adjust the balance of trade. The Serajgunge Jute Company employs several hundred hands in weaving gunny, or jute cloth for bags, which is exported to the value of $600,000 a year.

Serampore, a town in the district of Hoogly, Bengal, British India; on the Hoogly river, opposite the cantonments of Barrackpore, 18 miles N. of Calcutta. It was originally a Danish settlement, but was purchased by the British in 1845. The Baptist missionaries, Carey, Marshman, and Ward, established themselves here at the end of the 18th century. It is a peculiarly neat and clean town, and being connected by rail with Calcutta (or rather Howrah), is a favorite resort and country residence. It is well known as the place of issue for many years of "The Friend of India" newspaper, and for the manufacture of excellent paper. Pop. (1901) 44,451.

Serao, Matilde (ser-ä'ō), an Italian novelist; born in Patras, Greece, March 7, 1856. Her best stories are those descriptive of Neapolitan life: as "Faint Heart" (1881); "Fantasy" (1883); "Neapolitan Legends" (1886); "Opal"; "Little Minds"; etc.

Serapeum (se-rā-pē'um), the name given to temples dedicated to the god Serapis, the two most celebrated of which are those of Alexandria and Memphis. See SERAPIS.

Seraphim, according to Isaiah vi: 2–6, creatures with hands, feet, six wings, and a human voice. The traditional view, which originated with Dionysius the Areopagite, is that they are an order of angels, being the chief of the nine choirs. With this corresponds the derivation of the name from *saraph,* "to be high," as if the seraphim were princes. But recent Assyrian discoveries have enabled us better to understand Oriental symbolism, and a little attention will satisfy any one that it is in the New Testament that angels are first represented as properly winged creatures. The wings in Isaiah were purely symbolical. The seraphim were God's messengers between heaven and earth. In short, the cherubim and the seraphim originally symbolized, the former storm clouds, which concealed the deity, or winds, and the latter the lightning (Ps. civ. 3, 4). Curiously it is fire from

God's altar that one of the seraphim brings to Isaiah, fitting him thus to be a messenger for Jehovah. With this corresponds the derivation from *saraph*, to burn, making the seraphim "the burning" or "shining ones."

Serapis, or **Sarapis** (also found as OSARAPIS), the Greek name of an Egyptian deity, introduced into Egypt in the time of Ptolemy I. or Soter, and really a combination of the Greek Hades and Egyptian Osiris. He was not an Egyptian, but the Greek deity, with some Egyptian characters superadded; and his temple was not admitted into the precincts of Egyptian cities, finding favor only in the Greek cities founded in Egypt. It is said that 42 temples were erected under the Ptolemies and Romans to this god in Egypt. His resemblance to Osiris consisted in his chthonic or infernal character, as judge of the dead and ruler of Hades. The god had a magnificent temple, the SERAPEUM (*q. v.*), at Alexandria, to which was attached the celebrated library; another at Memphis, in the vicinity of the cemetery of the mummies of the Apis, which was excavated by Mariette in 1850; and another temple at Canopus. It appears that he represented or was identified with the Hesiri Api, or Osorapis, the "Osirified" or "dead Apis," who was also invested with many of the attributes of Osiris. The worship of Serapis, introduced into Egypt by the Ptolemies, subsequently became greatly extended in Asia Minor; and his image, in alliance with that of Isis and other deities, appears on many of the coins of the imperial days of Rome. In A. D. 146 the worship of the god was introduced into the city of Rome by Antoninus Pius; but it was not long after abolished by the senate, on account of its licentious character. A celebrated temple of Serapis also existed at Puteoli (see POZZUOLI), near Naples, and the remains of it are still seen. In Egypt itself the worship of the deity subsisted till the fall of paganism, the image at Alexandria continuing to be worshiped till destroyed, A. D. 398, by Theophilus, archbishop of that city. Busts of Serapis are found in most museums, and his head or figure engraved on certain stones was supposed to possess particular mystic virtues.

Seraskier, a name given to the commanders-in-chief of Turkish armies, and to the generalissimo or minister of war.

Sercq. See SARK.

Serenade, music performed in the open air at night; often, an entertainment of music given in the night by a lover to his mistress under her window; or music performed as a mark of esteem and good-will toward distinguished persons. The name is also given to a piece of music characterized by the soft repose which is supposed to be in harmony with the stillness of night. The Italian name *Serenata* is now applied to a cantata having a pastoral subject, and to a work of large proportions, in the form to some extent of a symphony.

Seres, a town of European Turkey, in the vilayet of Saloniki; on a tributary of the Strymon or Karassu; 45 miles N. E. of Saloniki; lies in a wide and fertile plain containing upward of 300 villages; is the seat of a kaimakam and a Greek archbishop; and is the most important trading town in the interior of Macedonia. It has a castle, numerous mosques, Greek churches, baths, benevolent institutions, manufactures woolen and cotton goods, gourd-shaped water flasks, and exports cotton, rice, tobacco, and grain.

Sereth, an important affluent of the Danube. It rises in the Carpathians in Bukowina, flows through Rumania, and joins the Danube 5 miles above Galatz after a course of 300 miles.

Serfs, a term applied to a class of laborers existing under the feudal system, and whose condition, though not exactly that of slaves, was little removed from it. Under this system, from the vassals of the king downward, the whole community was subject to certain degrees of servitude, and it was only on condition of specific services to be rendered to his superior that any individual held his fief. In the case of the lower classes this servitude amounted to an almost complete surrender of their personal liberty. There were two classes of laborers the villeins and the serfs proper. The former occupied a middle position between the serfs and the freemen. Hallam remarks, in reference to these two classes, that in England, at least from the reign of Henry II., one only, and that the inferior, existed; incapable of property and destitute of redress except against the most outrageous injuries. A serf could not be sold, but could be transferred along with the property to which he was attached. The revival of the custom of manumission counteracted the rapid increase of serfs. A serf could also obtain his freedom by purchase, or by residing for a year and a day in a borough, or by military service. By these various means the serf population gradually decreased. In most parts of the Continent they had disappeared by the 15th century. The extinction of serfdom in England and Scotland was very gradual. As late as 1574 Elizabeth issued a commission of inquiry into the lands and goods of her bondsmen and bondswomen in specified counties in order to compound for their manumission; and even in the 18th century a species of serfdom existed among Scottish miners. Serfdom in Russia was abolished by a manifesto of Alexander II. on March 17, 1861.

Serge, a kind of twilled worsted cloth used for ladies' dresses, gentlemen's summer suits, etc. Navy serge is a thick durable make of this stuff, used chiefly by seafaring folk.

Sergeant, Thomas, an American jurist; born in Philadelphia, Pa.; Jan. 14, 1782; was graduated at Princeton College in 1798, and admitted to the bar in 1802. He was made associate justice of the Philadelphia District Court in 1814; was Secretary of State in 1817–1819, and associate justice of the Pennsylvania Supreme Court in 1834–1846. He resumed practice in 1847. It is said that up to his time he was the only judge in Pennsylvania who had never had a decision reversed. He was the author of "Treatise upon the Law of Pennsylvania Relative to the Proceedings of Foreign Attachment" (1811); "Reports of Cases adjudged in the Supreme Court of Pennsylvania" (with William Rawle, Jr., 17 vols. 1814–1829); "Sketch of the National Judiciary Powers exercised in the United States Prior to the Adoption of the Present Federal Constitution" (1838); etc. He died in Philadelphia, Pa., May 8, 1860.

Sergeant, or **Serjeant,** a sheriff's officer, a bailiff; a title given to certain officers of the British sovereign's household, serjeant; a police officer of superior rank to a private. Sergeant-at-arms, an officer appointed by a legislative body, whose duties are to enforce the orders given by such bodies, generally under the warrant of its presiding officer. For serjeant in English law, see SERJEANT-AT-LAW. In military language, the second permanent grade in the non-commissioned ranks of the army. In the United States service there are regimental as well as company sergeants. Their duties are mainly indicated by the title, which is a compound of sergeant with the superior officer or the department they are intended to serve; as, sergeant-major, quartermaster-sergeant, color-sergeant, commissary-sergeant, ordnance-sergeant. The two spellings, sergeant and serjeant, are both based on good authority, but in the United States the form sergeant is usually adopted.

Sergeanty, Grand, a tenure in feudal times whereby the tenant held land of the crown by performing some service to the sovereign in his own person. Petty-sergeanty was a tenure of land from the king by the service of rendering to him annually some small article, as a bow, sword, spurs, or the like.

Sergius, the name of several popes.

SERGIUS I.; born in Syria, about 630, succeeded Conova in 687. He opposed the canons of the Council of Constantinople, whereupon Justinian II. sent his general-in-chief to arrest Sergius; but the exarch of Ravenna protected the Pope, who humanely interposed to save the life of Justinian's envoy. He instituted several ceremonies and established various churches at Rome. He died in Rome in 701.

SERGIUS II., was a native of Rome, and succeeded Gregory IV. in 844. He was elected without the authorization of the Emperor Lothaire, who dispatched an army into Italy, under the command of his son Louis. But the Pope succeeded in inducing that prince to retire, after having crowned him King of Italy. Shortly afterward, the Saracens from Africa ascended the Tiber, and ravaged the environs of Rome, but were prevented from gaining an entrance into the city itself, in consequence of the defense offered by the walls which surrounded it. He died in 847.

SERGIUS III., became Pope in 904, through the influence of the Marquis of Tuscany and of the notorious Roman lady, Marozia. These personages were at the head of a powerful party which had deposed Christopher. A son of Sergius, by Marozia, afterward became Pope by the title of John X. The character of this pontiff has been variously represented. He died in 911.

SERGIUS IV., was elected Pope, in succession to John XVIII., in 1009. Under his rule, and in consequence of his exhortation, the Italian princes combined to drive out the Saracens from the country. In his time, also, the Normans began to enter Italy. He died in 1012.

Seriema (*Dicholophus cristatus*), a grallatorial bird of the size of a heron inhabiting the open grassy plains of Brazil and other parts of South America. Its feathers are of a gray color, and a kind of crest rises from the root of the beak, consisting of two rows of fine feathers curving backward. The eye is sulphur-yellow, the beak and feet red. It is of retired habits, and utters a loud screeching cry, which somewhat resembles that of a bird of prey or the yelping of a young dog. The seriema is protected in Brazil on account of its serpent-killing habits and is often domesticated.

Series, a continued or connected succession of things in the same order, and bearing the same relation to each other; a sequence. In mathematics, a number of arithmetical or algebraic terms in succession, increasing or diminishing according to a certain law. Series derive their names from the laws which govern the formation of their respective terms. Thus, an arithmetical series is one whose consecutive terms have a common difference; a harmonic series one of which every three successive terms are in a harmonic proportion. A geometric series is one every term of which has a constant ratio to the preceding one; it belongs to the family of recurring series, in which each term is a constant function of one or more preceding terms.

In botany, a row or layer; in botanical classification, a grade intermediate between

a class and an order. In chemistry, a group of compounds, each containing the same radical. Thus the hydrocarbon, CH_4, methane, may take up any number of the molecules of the radical CH_2, thereby giving rise to the series C_2H_3, ethane, C_3H_8, propane, C_4H_{10} quartane, etc. In geology, a term long used more or less vaguely, but now precisely, of subdivisions of sedimentary strata.

Seringapatam (properly, Sri-ranga-patanant, "city of Vishnu"), a celebrated town and fortress in the province of Mysore, Madras presidency, India. It is on an island formed by two branches of the Kaveri, 245 miles S. W. of Madras, and is generally ill-built, with narrow, dirty streets. It was once the capital of Mysore. The palace, formerly extensive, is now in ruins. Other notable public buildings are the great mosque, and the pagoda of Sri Ranga, the arsenal and the cannon foundry. The massive fortifications were the work of Tippoo, the son of Hyder Ali, assisted by French engineers, and the fortress was three times besieged by the British, first in 1791, and afterward in 1792 and 1799. On the last occasion it was carried by assault, Tippoo himself being slain while fighting desperately, together with 8,000 men. Pop. 11,734, once 140,000.

Serinus, in ornithology, a genus of *Fringillidæ*. Bill short, stout, conical, broad at base; nostrils basal, round, hidden by stiff frontal feathers directed forward, gape straight, without bristles; wings moderately long, rather pointed; tail moderate in length, deeply forked. *S. hortulanus,* the serin; *S. cononicus,* Tristram's serin; *S. canarius,* the canary; and *S. pusillus,* the red-fronted finch, inhabit the Western palæarctic region, but species occur in the Eastern palæarctic, Oriental, and Ethiopian regions.

Serjeant=at=law, in England, a lawyer, formerly of the highest rank under a judge. The judges in common law formerly were always selected from the serjeants, but this monopoly has been abolished. A serjeant is appointed by a writ of the crown. A king's counsel, except in certain circumstances, takes precedence of a serjeant-at-law. Serjeants' Inn is a society or corporation consisting of the entire body of serjeants-at-law.

Serous Fluids, a name given to the lymph-like pellucid fluids secreted by certain membranes and contained in certain cavities of the body. An excess of this secretion constitutes a diseased and often a dropsical condition.

Serous Membrane, in anatomy, a membrane having its surface moistened by serum. They line the cavities of the body from which there is no outlet. The chief are the peritoneum, the two pleuræ, the pericardium, and the arachnoid membrane. Serous membranes differ from mucous membranes in having thinner layers, finer fiber, and an epithelium with only a single layer of polygonal cells.

Serpent, in astronomy, one of the 48 ancient constellations extending serpent-like through a wide expanse of sky. The head is under Corona borealis, the body winds through Ophiuchus, and the tail reaches the Milky Way near the constellation Aquila. Its stars are generally very small, the largest, *Cor serpentis,* being intermediate between the second and the third magnitude.

In music, an almost obsolete bass instrument of a powerful character. It is a wooden tube, about eight feet long, increasing conically from inch diameter at the mouthpiece to four inches at the open end, twisted into U-shaped turns, followed by a large circular convolution. This is covered with leather, and has a mouth piece like a horn or trombone, and keys for the several notes to be produced. It was invented by a French priest at Auxerre in 1590, and is frequently used in the orchestra to strengthen the bass part; but it requires to be very skilfully blown. The serpent is a transposing instrument, being in B flat, and the part it is to take is therefore written a note higher than its real sound. Its compass is three octaves and one note. In pyrotechny, a small paper tube, filled with mealed powder or rocket composition, not very compactly driven. Serpents are used for filling paper shells or the pots of rockets, and pursue a wavering serpentine course through the air when ignited.

SERPENT.

Serpent, in zoölogy, the *ophidia,* an order of reptiles popularly distinguished from the rest of the class by having a very elongated body and no external limbs. They are very widely distributed, abounding in the tropics, where they attain their greatest size, absent only from the Arctic and Antarctic regions, and they are mentioned in the earliest records of the human race. The length of the body is a marked feature. The number of vertebræ varies greatly, more than 400 occurring in some of the great pythons. No sacrum exists, and there is no distinction between or divisions of the spine into cervical, dorsal, and lumbar vertebræ. A notable feature is the large number of ribs; almost all the vertebræ, with the exception of the atlas or first, bearing these. The ribs articulate with the transverse processes of the vertebræ, and are not attached inferiorly to any breastbone, but are imbedded in cartilages which

Serpent

are in turn connected with the great scales or scuta that cover the ventral surface of the body. The premaxillæ are represented usually by a single small bone, which rarely has teeth, and is joined to the maxillæ by fibrous tissue only. The floor of the skull is flat, while in front it diminishes greatly in height. The hyoid is very rudimentary, and is represented by two cartilaginous filaments, unconnected in any way with the skull. In the pythons a pair of rudimentary hind limbs exists, and traces of a pelvis are also found.

Locomotion is effected by the muscular contractions of the body, the animals moving literally on the ends of their ribs. Teeth are borne by the premaxillary bones, by the maxillaries, palatine, and pterygoid bones, and by the dentary part of the mandible. One of the most singular developments of teeth in serpents and indeed in the entire animal kingdom, occurs in a little African snake — *Rachiodon*. In this snake, the ordinary teeth are very small, but the lower or inferior spines of some eight or nine vertebræ of the neck are long, and their enamelled tips project into the interior of the gullet, so that when the snake swallows an egg, the brittle morsel passes entire into the gullet, and is broken only when fairly on its way into the stomach. The teeth of serpents are not implanted in sockets, but become ossified to the surfaces of the bones which bear them. They are replaced when worn away or injured by new teeth developed at the bases of the former ones. The most interesting modification of the teeth of serpents, however, is in the development of certain of these organs to form the well-known poison fangs. In the typically poisonous serpent (*e. g.*, the rattlesnake) the upper jaw bears two largely developed teeth termed fangs. Each fang has a very deep groove running down its anterior aspect, and the margins of this groove are opposed so as to convert it into a canal — hence the fangs are said to be canaliculated. This canal opens by a wide aperture above into the poison gland, so that by the compression, muscular and friable, of the gland, the poison flows down the canal and is ejected, through the lower minute aperture, into the wound made by the fang. The poison gland itself is merely an extraordinary development of one of the salivary or buccal glands. It does not exist in all serpents, and when developed lies in front of and below the eye.

The poison of different serpents varies in intensity and virulence, but appears to take effect on the blood. One theory is that snake poison acts by preventing oxygenation of the red blood corpuscles. No specific remedy is yet known for snake bite. The most effective treatment is at once to tie a ligature tightly round the limb, above the wound, and to excise the part freely, and then to suck the blood repeatedly, and cauterize the parts deeply before removing the ligature. If a finger be the seat of a bite, it should be cut off at once. In sucking a poisoned wound, the danger consists in there being a crack or wound in the mouth by which the poison may be absorbed. In cases of serpent bites Professor Halford recommends the injection of ammonia into one of the large veins as near the bite as possible. Professor Fayrer, however, states that in wounds produced by serpent bites in India, when these wounds fairly penetrate the skin, the injection of ammonia into the veins rather hastens death than otherwise, and he regards the plan as positively hurtful.

The digestive system of serpents presents nothing worthy of special remark, save that the intestine ends in a cloaca opening transversely. There is no urinary bladder, and the heart (as in all reptiles save the *Crocodilia*) is three-chambered. The lungs are long and cellular, but, as a rule, only one is fully developed. The tongue is bifid at its tip, and is remarkably extensile. The eye exhibits certain notable peculiarities. No true eyelids are developed, and hence the peculiar stony gaze of these reptiles; but the eye is surrounded by scales, attached to which is the transparent antocular membrane regarded by some authorities as the united and modified eyelids. Inside the antocular membrane a double fold of the conjunctiva of the eye is found; and the membrane is periodically shed or cast off with the serpent's skin, the animal being blind until the membrane is renewed. The pupil of the eye is round, but may be vertical, as in the boas and venomous serpents.

Serpents are divided into three groups: innocuous, venomous colubrine, and viperine, the last two groups possessing poison fangs, the boas, which kill their prey by constriction, belonging to the first. Broadly speaking, the innocuous serpents are oviparous, the venomous are ovoviviparous. Most of the former deposit the eggs in a long string in some heap of decaying vegetable matter, and leave them; while some of the larger serpents coil round their eggs, and hatch them by the heat of their bodies. The senses of smell and taste are probably not acute; the ear has no external opening, but they are sensible of sound, and especially of sharp, shrill notes; the eyes are small, and protected from injury by a transparent integument, which comes away with the slough when the animal casts its skin, which happens at least once a year. Serpents are very variously colored; some are extremely beautiful; but as a rule, the venomous kinds are of darker and more uniform coloration than those which are not poisonous. Some of the innocuous kinds are capable of being tamed; the rat snake (*Ptyas mucosus*) is often kept in

houses in India for the purpose of destroying rats and mice, but by the generality of mankind serpents are regarded with aversion and horror; and Brehm and Darwin both note the terror which they excite in monkeys — zoölogically so near akin to man.

Serpent Charming, an art of great antiquity, confined in practice exclusively to Eastern countries. Several allusions are made to it in the Bible, as Ps. lviii: 5; Eccl. x: 11; Jer. viii: 17, and also in classical writers. The power exercised by the charmers over poisonous serpents is unquestionably remarkable, and though there is little doubt that the common practice of the charmers is to extract the fangs before exhibiting their feats, yet we have good authority for believing that it is not unusual to dispense with this. The instrument usually employed in serpent charming is a kind of pipe, which is varied by whistling and the use of the voice. The effect of this medley of sounds is to entice the serpents from their holes, and this done the serpent charmer pins them to the ground with a forked stick. In India and other places the art of serpent charming is an hereditary profession, and is practised for the purpose of gaining a livelihood by administering to the amusement of the public. Besides the evident power music has on the serpents, they appear to be influenced in a marked degree by the eye of the charmer, who controls them by merely fixing his gaze on them.

Serpentine, an abundant mineral occurring in one or other of its numerous varieties in all parts of the world. Crystallization, probably orthorhombic, but when found in distinct crystals always pseudomorphous. Occurs usually massive, but sometimes fibrous, foliated, fine granular to cryptocrystalline. Hardness, 2.5–4; but varying according to purity; sp. gr., 2.5–2.65; luster, sub-resinous greasy, pearly, dull; color shows many shades of green, yellow; streak, white, shining; translucent to opaque; feel, greasy; fracture, either conchoidal or splintery. Composition: Silica, 44.14; magnesia, 42.37; water, 12.89 = 100, corresponding with the usually-accepted formula, $2MgOSiO_2 + MgO,2HO$. Dana divides this species as follows:

A. Massive: (1) Ordinary massive, comprising precious and common serpentine; (2) Resinous, embracing Retinalite and Vorhauserite; (3) Porcellanous; (4) Bowenite.
B. Lamellar: (5) Antigorite, (6) Williamsite.
C. Thin Foliated: (7) Marmolite, (8) Thermophyllite.
D. Fibrous: (9) Chrysotile, (10) Picrolite, including Metaxite and Baltimorite.
E. Crystallized.
F. Serpentine rocks.

In petrology, a rock consisting essentially of a hydrated silicate of magnesia, resulting from the alteration of magnesian rocks, of all geological ages, especially those of olivine. It contains also some protoxide of iron, and other impurities which cause a great variation in color, which is often of a dull green, but is also marbled and mottled with red and purple. It takes a high polish, and is turned into ornamental articles. The accessory minerals are numerous, the most frequent being pyrope, bronzite, magnetite, and chromite. In geology, serpentine is considered an altered intrusive rock, originally a trap or dolerite with olivine. It has been maintained that in some cases serpentine may have arisen from the alteration of sedimentary rocks.

Serpent Worship, ophiolatry; the worship of serpents as symbols or avatars of a deity, a branch of animal worship with a wide range in time and space. Fergusson connects it with tree worship. He considers that the curse pronounced on the serpent (Gen. iii: 14, 15) had reference to serpent worship, and was put in by the writers of the Pentateuch, who "set themselves to introduce the purer and loftier worship of the Elohim, or of Jehovah," in order to discountenance an older faith, to which from time to time some of the Jews seem to have reverted (II Kings xviii: 4; Wisdom xi: 15, Story of Bel). In Greece the center of serpent worship was the grove of Epidaurus, whence the Romans, on the occasion of a plague, A. U. C. 462, sent for a serpent, and brought it to Rome with great ceremony; at the siege of Troy a serpent appears as an omen of victory to the Greeks, and from Plutarch we know that Alexander was reputed to have been of a serpent race. In Roman history many traces of serpent worship appear. In addition to the embassy to Epidaurus, may be cited the fate of Laocoon, the snake which glided from the tomb of Anchises and which Æneas considered to be either the *genius loci* or the spirit of his father; and the sacred serpent of Lanuvium; while from Persius and from discoveries at Pompeii and Herculanæum, it is clear that the serpent was a sacred emblem.

In modern times serpent worship is prevalent to a great extent in India. The Hindu year is divided into months consisting of two parts — the light half and dark half of the moon. All, therefore, overlap our calendar months, and to a stranger the confusion of days is very perplexing. Henry S. Olcott, writing from Bombay, gives a vivid description of the festival of the cobra. Under date of July 24, he says: We are now in the month Shravan, and at the fifth day of the same; a great day, the festival of the cobra or *nag*. Today, in every orthodox Prabhu Hindu's house, the women have traced on a wooden stool, with sandalwood powder and red lead, the figures of nine snakes, two full sized and seven young. Of the latter, one appears to have had his tail chopped

Serpent Worship

off — in short, a bob-tailed snake. Below this pythonic symbolism appear the images of a tenth snake, also with its seven young, a woman holding a lighted lamp, a stone slab, and a well with a snake's hole — more or less faithful to nature — near by. Gathered about this altar the married women of the house, that is to say, the father's, sons', brothers', brothers-in-laws', and perhaps other wives, pay their adoration. Each throws on the drawing parched grain, pulse, round slices of plantains, cucumber and cocoanut. Leaf cups filled with milk and pulse are placed near by, red lead is sprinkled and flowers strewn on it; and then, after praying the snakes to protect them and their families the women withdraw. The children are then gathered about the knees of the eldest woman, who proceeds to pour into their attentive ears the legend of the "Nine Snakes and the Woman with the Lamp."

The head man or chief proprietor of a village had seven daughters-in-law. Six he liked, but the seventh he hated, and because she was an orphan made her to do all the housework and live on the scraps left in the cooking pots. One day, while all the seven girls were at the house well, the six were saying that their relatives had come to take them home for a festival; the seventh was silent, for, being an orphan, she had no home to be taken to. A male and a female snake from their hole close by overheard the talk, and the male snake told Mrs. S. that he would ask the seventh daughter-in-law to their feast and keep her till his wife had safely passed through a certain domestic event then expected. In the afternoon when the orphan went to graze the cattle, the male snake, in the form of a handsome youth, came to her, and said: "Sister, I am one day coming to take you home; so when I come be ready to start." One day when the house people had dined, the orphan took the cooking pots to clean by the well side. Gathering the scraps into one pot, she went to bathe on the other side of the well. When the Hindu Cinderella was gone the female snake, coming out of the hole, ate up all the scraps. After bathing the orphan came back to eat her dinner, but, finding it gone, instead of cursing the thief, as either of the "proud sisters" of the cinder-wench would have done, she blessed him, saying, "May the stomach of the eater be cooled." Hearing these words the female snake was overjoyed, and she told her husband to lose no time in bringing the orphan home.

The male snake, taking human form, went to the head man's house and told the orphan he was come to take her home. Asking no questions, she went with him. On the way the snake told her who he was, and that on entering the hole he would turn back into a snake, and she was to hold him fast by the tail and follow. Trusting and obedient, she followed him, and at the bottom of the hole found a beautiful gold house set with gems; and in the middle, on a hanging swing of precious stones, a female snake. While the orphan held a lighted lamp the expected event came, and seven little snakes blessed their parents and blinked their beadlike eyes at the light. One of them climbed on the girl, who, in her fright, let fall the lamp, and it cut off part of the snake's tail. When the brood grew up they laughed at the bob-tailed victim, and he, discovering how he had been maimed, registered a vow to kill the head man's daughter, and wipe out the insult in blood. Making his way into the house he found her, for it was Nagpanchmi Day, to-wit, July 24, A. M.— worshiping snakes and laying out food for them to eat. Pleased with this, he kept quiet till the girl left the room, ate the offering, and went back and told his parents of the girl's devotion. The old snakes rewarded her freely, making her rich and the mother of many children.

This is all of the Hindu legend. Of its antiquity, all that can be said is that it is immense; but the custom to which it gave birth still survives, and I saw its celebration myself this very day. From early morning till dark the noble and numerous fraternity of snake charmers have been perambulating the streets of Bombay, and calling on the pious to worship their sinuous pets. This is done, and both snake and master are regaled with milk and grain, while a harvest of copper pice is garnered into the pockets of the latter. Mr. Raghunath says that the Bombay Prabhu women fill leaf cups with milk and pulse, and place them in corners of the garden for snakes to feed on; and, "as they are hurtful to snakes, no grinding, baking, or boiling is allowed in Prabhu houses."

Among the Kschartrya caste there is a different form of serpent worship on this day The women of the house take a square board and trace on it with rice grains the form of a serpent. Turmeric powder mixed with catechu and lime and the powdered fiber of sapan wood and arrowroot, both in the form of a dry powder, are then dropped on the serpent's head, a touch of scented arrowroot, *abil*, is added, incense is burnt, flowers are laid over all and a special set of prayers, *mentrams*, are intoned by a Brahmin. These are the words of one verse:

"Abeelchancha, gulalancha, chuwar-chundunmawacha,
With perfumed roots, gulal, washed rice, and sandalwood,
Anadeene, danodhata, jinjeetam Purmeshwara,
The God eternal, wealth donor, him I, with these adore."

A little brass cup of sweetened milk is then set at the snake's head, another verse is intoned, some more washed rice is thrown, some camphor burned on a brass spoon,

a final prayer is said, a bell rung, and after the throwing of more flowers, the ceremony is concluded. The board is left intact till the following morning, when the rice serpent, with all its decorations, is thrown into the family well.

Another version of the origin of snake worship, also of Hindu source, is as follows:

Once on a time there lived a Brahmana who though possessed of much learning, was very poor. His wife was devoted to him; and since they could not gain a livelihood where they resided, she urged him to seek it elsewhere. Consenting, he set out. For lack of anything better she gave him a vessel filled with sweetened water, as his sole provender. After journeying 10 miles, the Brahmana laid him down under the shade of a great banyan tree to escape the intense heat of the summer sun, and fell asleep. Presently there issued forth from the hollow of the tree the Takshaka Naga, who drank all the sweet water from the sleeper's vessel, and then coiled himself in this capital resting place. When the Brahmana awoke he discovered his loss and saw the serpent. He closed the mouth of the vessel with a cloth, thinking, in his despair, that he would give the vessel as a present to his wife, so that the snake might bite her and the children as well as himself, and so relieve them of their troubles and vexations at one stroke. On his return home, his wife being away on some errand, he left the vessel with the children, to be given her on her return, and then himself wandered off somewhere to await the catastrophe. She returned, opened the vessel and found it to contain a necklace of diamonds. Fancy the joy, the recall of the doubting husband, the feast, the sale of the necklace to "the principal banker of the city" at a good round sum. The banker put the necklace into his box. Soon after the rajah, who was going to have a wedding ceremony at his palace, wanted a diamond to complete the necklace. The banker went to get the necklace to supply the rajah's necessity, opened the box, and found — no necklace, but the face of a living male child, with his thumb in his mouth. Banker, childless, rejoices; rajah, surprised, but not skeptical. The boy thrives, at 16 marries, and his wife comes to live with him, accompanied by a train of maiden companions — daughters of the Takshaka Naga. These cunning minxes incite the wife to ask the husband to what race he belongs; which she does, adding, to make his compliance surer, that she will not speak to him till he tells the secret. He thereupon does not tell, but does start on a pilgrimage to Benares with her and the baggage. Arrived at a forest where there was a large well, he told his wife he would now answer her questions. So saying, he descended into the well by a flight of steps and reached the water. Here he transformed himself into a cobra, expanded his hood, and disappeared.

The wife, left alone in the desert — for the snaky girls had also vanished — too late repents her curiosity, and utters loud lamentations for several days successively. At last a shepherd heard her cries, came, and being told her story, gave her sound shepherd advice. She must return home, observe the *Vrala* of the *Naga panchami*, and fill in the month of Bysakha or Vaishakh — April–May — four kundas, or pools, with milk, sandal-wood, flowers, and unguents. Having done this, she should go up a tree and watch results. The great snake god would come, drink the milk from the milk pool, roll himself in the next pool, go to the third and rub his body with flowers, partake of the unguents in the fourth, and end by blessing the person who had so hospitably entertained him. At this auspicious moment she must descend from the tree and claim from her ophidian father-in-law the blessing and the return of his son, her errant husband. She took this golden counsel, everything succeeded admirably, the lord of the serpents was pleased to grant her prayer, and her lost but not forgotten one was recalled from Patal and graciously consented to live with her again. The legend concludes by saying that this lesson of conjugal discretion and felicity inculcates "the propitiation of the Naga Davata, or the serpent deity."

Serpukoff, an ancient Russian town, 57 miles by rail S. of Moscow, on the Nara, 3 miles from its confluence with the Oka. It contains a cathedral (1380), and is a place of considerable commercial and industrial importance, manufacturing chiefly cottons, woolens, leather, paper, furniture, and earthenware. Pop. (1885) 20,983. It was formerly a fortress protecting Moscow on the south.

SERPULA.

Serpula, a genus and family of *Annelidæ*, whose organs of respiration are in tufts attached to the head and anterior part of the body. In most cases, they live in tubes, and hence are often called tubicolæ. In some the tubes are calcareous, in others horny, the result of transudation; others, still, are formed of grains of sand, or other particles,

bound together by a membrane, also transuded. The genus serpula has the anterior portion spread out in the form of a disk armed on each side with bundles of coarse hairs, and on each side of the mouth is a tuft of branchiæ, shaped like a fan, and generally tinged with bright colors. At the base of each tuft is a fleshy filament, one of which is ever elongated, and expanded at its extremity into a disk, which serves as an operculum, and seals up the opening to the tube, when the animal is withdrawn into it. The calcareous tubes of the *Serpulæ* cover submarine bodies.

Serra da Estrella, a lofty range of granite mountains near the middle of Portugal, highest summit 6,460 feet. The range contains some remarkable lakes, part of which are tepid.

Serranus, sea perches; a genus of *Percidæ*; found on the shores of all temperate seas, and abound in the tropics, some of the latter species entering brackish and even fresh water, but all spawn in the sea. Body oblong, compressed, with small scales; teeth villiform, with distinct canines in each jaw, teeth on vomer and palatine bones; one dorsal, mostly with 9 or 11 spines, anal with 3. Two species, *S. cabrilla*, the smooth serranus, and *S. gigas*, the dusky perch, are met with in the British Channel, and are common in the Mediterranean.

Serratula, in botany, sawwort; the typical genus of *Serratuleæ*. Heads solitary or corymbose, sometimes diœcious, purple or white; involucre oblong, imbricated with straight unarmed scales; receptacle chaffy; the scales split into linear bristles; corolla regular, tubular; pappus persistent, pilose; hairs filiform, in several rows, the interior the longest; filaments papillose; anthers with a short blunt appendage, ecaudate at the base. Known species about 30.

Serrel, Edward Wellman, an American engineer; born in New York city, Nov. 5, 1826; was assistant engineer of the Central Railroad of New Jersey in 1845, and of the Panama Survey in 1848; superintended the building of the Niagara Suspension bridge in 1850; had charge of the Hoosac tunnel in 1858; and directed the construction of the Bristol bridge over the Avon river, England. In the Civil War he served as chief engineer of the Army of the James; designed and superintended the construction of the "Swamp Angel" battery that bombarded Charleston; suggested many valuable improvements in guns and processes; and was brevetted Brigadier-General of volunteers in 1865. Subsequently he settled in New York city, and engaged principally in the building of railroads. In addition to papers on technical and scientific subjects he published nearly 50 reports on railroads and bridges. Died in 1906.

Serres, Olivia Wilmot, an English story-writer; born in 1772. She claimed to be a daughter of the Duke of Cumberland, brother of George III., but failed to make the claim good before a parliamentary committee. She wrote: "St. Julian," a novel (1805); "Flights of Fancy," poems (1806); "Olivia's Advice to Her Daughters"; "The True Messiah; or, St. Athanasius's Creed Explained" (1814). She died in 1834.

Serricornia, or **Serricornes,** in entomology, a tribe of *Pentamera;* elongated beetles, with antennæ short or moderate in length, most of the joints so prolonged on the inner side as to appear at least serrate, or in some cases pectinate. Head generally retracted up to the eyes in the prothorax, a projection of the prosternum received into a cavity of the mesoternum. Families: *Buprestidæ, Throscidæ, Eucnemidæ,* and *Elateridæ.*

Sertorius Quintus, a Roman general; a native of Nursia, in the country of the Sabines. He served under Marius in the Cimbric war, afterward in Spain, and was made quæstor 91 B. C. He joined the party of Marius in the Civil War, and commanded the Cinna at the siege of Rome 87 B. C.; but was indignant at the atrocious proscription which followed. The license and cruelty of the slaves especially excited his disgust, and he fell on them and slew several thousand. Appointed prætor in 83, he went soon after to Spain, where his courage and skill as a soldier were well known. He had, however, to retire before the forces of Sulla, and went to Africa; but on the invitation of the Lusitanians, returned and put himself at their head to fight for independence. His progress was rapid; he made himself master of the greater part of Spain, established a senate, founded a school at Osca for the education of young Spaniards in Greek and Roman learning, and to increase the superstitious reverence of the people for his person, gave out that he had communications with the gods through the white fawn which always accompanied him. Metellus Pius was sent against him in 79, but could effect nothing; two years later Pompey joined Metellus, but Sertorius reinforced by Perperna held out against both till 72. He entered into negotiations with Mithridates, which caused fresh alarm at Rome. But his influence and popularity were shaken by his despotic acts, and especially by the massacre of all the scholars at Osca; and he was assassinated by Perperna, his ally, at a banquet 72 B. C.

Sertularia, in zoölogy, the type-genus of *Sertulariidæ.* Plant-like; stems simple or branching, jointed, rooted by a creeping

stolon; hydrothecæ biserial, opposite to alternate, without external operculum, mostly arranged in pairs, gonothecæ scattered with a simple orifice, and without internal marsupium. Species very numerous, with representatives in almost all seas.

Serum, in anatomy, a pale yellowish liquid obtained by drawing blood from the vessels and allowing it to separate into a thicker and a thinner portion. The thinner one is the serum. It consists of proteid substances, fats, extractives, and saline matter. The solid contents of the serum is 9.22 in males, and 8.29 in females; the rest is water. There is also a serum of chyle and one of lymph. In chemistry, the opalescent liquid, containing milk-sugar and various salts, which separates when milk is curdled by the action of acids, rennet, etc.

Serum-Therapy, the treatment of disease by injections of sterilized blood-serum from immune animals; the use of antitoxine as a preventive of, or cure for, toxinal diseases. The serum of animals inoculated against a very virulent venom, such as that of the cobra, is perfectly antitoxic to the poisons of all kinds of serpents and even of scorpions.

Serval, the *Felis serval*, the bush cat, or African tiger-cat, distributed over Africa, abounding in the S. Its body is proportionately longer, and its tail shorter than those of the true cats, in this respect approaching the lynxes, from which it is differentiated by the absence of ear tufts.

SERVAL OR BUSH CAT.

Body about 40 inches, tail 16 inches, fur tawny, spotted with black. It is found in the extensive grassy plains, where it preys on antelopes and other small game.

Servetus, Michael (properly Miguel Servede), a learned Spaniard, memorable as a victim of religious intolerance; born in Villa Nueva, Arragon, Spain, in 1511; was the son of a notary, who sent him to Toulouse to study civil law. Here he began to give his attention to theology, and having formed views of the Trinity antagonistic to the orthodox doctrine he removed to Germany, where he printed a tract entitled "On the Errors of the Trinity" (1531), followed a year later by his "Dialogues on the Trinity." Finding that his opinions were obnoxious to Germany, he escaped to France under the name of Michael of Villa Nueva. After fulfilling an engagement with the Frellons, booksellers of Lyons, he went to Paris, where he graduated as doctor of medicine. At Paris Servetus met Calvin for the first time, and an arrangement was made for a theological

MICHAEL SERVETUS.

discussion between them; but Servetus failed to appear. In 1538 he quarrelled with the medical faculty at Paris, and proceeded to Charlieu, near Lyons, where he practised three years, subsequently moving to Vienna. Here, in 1553, he published his matured theological system under the title of "Restoration of Christianity." He was arrested for heresy and imprisoned, but contrived to escape, and purposed to proceed to Naples. He was, however, apprehended at Geneva on a charge of blasphemy and heresy, and his various writings were sifted in order to ensure his condemnation. The divines of all the Protestant Swiss cantons unanimously declared for his punishment, and Calvin was especially urgent and emphatic as to the necessity of putting him to death. As he refused to retract his opinions he was burnt at the stake in Geneva, Switzerland, Oct. 27, 1553. Servetus is numbered among the anatomists who made the nearest approach to the doctrine of the circulation of the blood.

***Servia** (Slavonic, Serbia; Turkish, Syrp), an independent kingdom of Eastern Europe; bounded N. by Austria-Hungary, from which it is separated by the Save and the Danube; E. by Rumania and Bulgaria; S. by Turkey; and W. by Bosnia; area, 19,050 square miles; pop. (1906) 2,688,747. Capital, Belgrade; pop. 80,747. The surface of Servia is elevated and is traversed by ramifications of the Carpathians in the N. E., of the Balkans in the S. E., and of the Dinaric Alps in the W. The

*For Map, see Turkey.

summits seldom exceed 3,000 feet, though the highest reaches 6,325. The whole surface belongs to the basin of the Danube, which receives the drainage partly directly, and partly by the frontier rivers Save, augmented by the Drin and the Timok, but chiefly by the Morava, which flows through the center of the kingdom. The climate is somewhat rigorous in the elevated districts, but mild in the valleys and plains. There are extensive forests and uncultivated wastes, the forest area being 42 per cent. of the total area. The chief agricultural products are maize, wheat, flax, hemp, and tobacco. Wine is grown in the districts adjoining Hungary, and the cultivation of prunes is extensive. Lead, zinc, quicksilver, copper, iron, and coal are found. Manufactures include carpet weaving, embroidery, jewelry, and filigree work. The principal exports are dried prunes, pigs, wool, wheat, wine, hides, cattle, and horses; imports, cotton, sugar, colonial goods, hardware, etc. The bulk of the trade is with Austria. The total exports in 1898 amounted to $11,398,296; imports to $8,220,384. In 1898 there were 354 miles of railway and 2,526 miles of telegraph. The great majority of the inhabitants are Slavonians, and adhere to the Greek Church. The Servian language, formerly often called the Illyrian, is a melodious Slavonic dialect closely allied to the Bulgarian and Slovenian, and forms with them the southern Slavonic group. Several collections of patriotic Servian songs have been published, and both Goethe and Grimm have acknowledged the excellence of Servian poetry. In prose literature, however, little has been produced besides theological and religious works. The present constitution of Servia dates from 1889. The government is an hereditary monarchy, and the people are represented by an elected legislative assembly called the *skupshtina*. The principal source of revenue is a capitation tax; the revenue for 1900 was estimated at $15,434,918; the expenditure at $15,140,706; the public debt in 1899 was $83,382,561. The full war strength of Servia is 353,366 men. Servia is divided into 15 (formerly 22) administrative districts, of which Belgrade (the capital) forms one by itself.

History.— Servia was anciently inhabited by Thracian tribes; subsequently it formed part of the Roman province of Mœsia. It was afterward occupied in succession by Huns, Ostrogoths, Lombards, Avares, and other tribes. The Servians entered it in the 7th century, and were converted to Christianity in the next century. They acknowledged the supremacy of the Byzantine emperors, but latterly made themselves independent, and under Stephen Dushan (1336–1356) the kingdom of Servia included all Macedonia, Albania, Thessaly, Northern Greece, and Bulgaria. About 1374 a new dynasty ascended the throne in the person of Lazar I., who was captured by the Turks at the battle of Kossova (in Albania) in 1389, and put to death. Servia now became tributary to Turkey. About the middle of the 15th century it became a Turkish province, and so remained for nearly 200 years. By the peace of Passarowitz in 1718 Austria received the greater part of Servia, with the capital, Belgrade. But by the peace of Belgrade in 1739 this territory was transferred to Turkey. The barbarity of the Turks led to several insurrections. Early in the 19th century Czerny George placed himself at the head of the malcontents, and, aided by Russia, succeeded after eight years of fighting in securing the independence of his country by the peace of Bucharest, May 28, 1812. The war was renewed in 1813, and the Turks prevailed. In 1815 all Servia rose in arms under Milosh, and after a successful war obtained complete self-government, Milosh being elected hereditary prince of the land. Milosh was compelled to abdicate in 1839, and was nominally succeeded by his son Milan, who died immediately, leaving the throne vacant to his brother Michael. In 1842 this prince was compelled to follow the example of his father and quit the country. Alexander Kara-Georgevitch, son of Czerny George, was elected in his room; but in December, 1858 he also was forced to abdicate. Milosh was then recalled, but survived his restoration little more than a year. His son Michael succeeded him (1860), but was assassinated by the partisans of Prince Alexander July 10, 1868. The princely dignity was then conferred on Milan (Obrenovitch), grand-nephew of Milosh. After the fall of Plevna in the Russo-Turkish war of 1877–1878 Servia took up arms against Turkey, and by the treaty of Berlin (July 13, 1878) it obtained an accession of territory and the full recognition of its independence. It was erected into a kingdom in 1882. In 1885 a short war took place between Servia and Bulgaria, resulting in favor of the latter. In 1889 Milan abdicated in favor of his son who was crowned as Alexander I., and assassinated with Queen Draga, in a military revolt, June 10, 1903. He was succeeded by PETER I. (*q. v.*)

Service Men of the Spanish War, an association organized at Lexington, Ky., Nov. 5, 1898, with the following officers: Commander, Col. R. W. Leonard, 12th New York Volunteers; Vice-Commander, Lieut.-Col. W. R. Banks, 3d Mississippi; Adjutant and Chief of Staff, Capt Wilson I. Davenny, Commissary of Subsistence, 1st Brigade, 2d Division; Treasurer, Col. George W. Gundon, 160th Indiana.

The founders of the new society made choice of the designation "service men"

as equally distinctive of the men who waited in vain for orders to go to the front, and the more favored ones who lived through the exciting scenes of actual conflict. The boys in their teens, of whom there were thousands in the service, were considered by the founders as hardly to be classed as "veterans," but were fairly "service men," in that they performed their duty wherever orders took them and endured with impatience the dull routine of camp life.

In the list of charter members are to be found the names of many of the most prominent officers in the army during the war with Spain. They represent all sections of the United States and all shades of political belief, and constitute a guarantee of the permanence and worthiness of the organization. Such men as Major-General S. B. M. Young, who ordered the famous charge at San Juan, President Theodore Roosevelt and Major-General Joseph Wheeler affixed their signatures, as charter members, with nearly 100 more officers.

In its purposes the new organization is purely social and patriotic — to cement the friendships formed in the war with Spain, and to foster fealty to the free institutions of the country; to weld into a new brotherhood the young men, as well as the older ones who stood together for human liberty under the Stars and Stripes in the dawn of a new century.

Service Tree, the *Pyrus sorbus* or *domestica*, a native of Continental Europe and Western Asia. It has serrate leaves, unequally pinnate, and cream-colored flowers. It is from 20 to 60 feet high. Two varieties, the pear-shaped, *P. S. pyriformis*, and the apple-shaped, *P. S. maliformis*, are cultivated in parts of France and near Genoa for their fruit. Also *Pyrus (sorbus) torminalis*, the wild service tree. It is a small tree growing in woods and hedges, but rare and local, with 6 to 10 lobed serrate leaves, pubescent below when young, but glabrous on both sides when mature. Flowers numerous, white, appearing in April and May. The fruit pyriform or sub-globose, greenish-brown, dotted. It is eatable, and is sold in parts of Europe.

SERVICE TREE.
a, fruit, showing section.

Servita. See SARPI, PIETRO.

Servites, the name commonly given to a monastic order, the Religious Servants of the Holy Virgin, founded in 1233 by seven Florentine merchants at Mount Senario, near Florence. St. Philip Benoit, the fifth general, saved the order from suppression in 1276, and in 1487 Pope Innocent VIII. bestowed on the Servites the privileges of the four great mendicant orders. The life is one of austerity and continual prayer; the habit is black, with a leather girdle, a scapular, and a cloak, and the rule is a modification of that of St. Augustine. The strength of the order lay chiefly in Italy and Germany. Since the French Revolution many houses have been founded in different countries.

Servitude, a state or condition of a serf, slave, or bondman; state of voluntary or involuntary subjection to a master or employer; service; slavery; bondage; position in life of a servant;—hence, a state or condition of slavish or helpless dependence; as, marriage with a rich and ugly old woman is splendid servitude. In civil law, the right to the use of a thing, without property in the same, for all or for some particular purposes. It consists either in the right to do some act, as to gather fruit from the estate, or to prevent the owner of the property from doing certain acts, as building walls beyond a certain height, blocking up a window, etc.

Servius Tullius, the 6th king of Rome. According to the tradition he was the son of a slave given by the elder Tarquin to Tanaquil, his wife. He married Tarquin's daughter, and on the death of his father-in-law (578 B. C. according to the usual chronology) he was raised to the throne. He defeated the Veientines and the Etruscans, and divided the population of Rome into tribes, instituting at the same time the *comitia centuriata* and *tributa;* he also beautified the city, and built several temples. According to the common story Servius married his two daughters to the grandsons of his father-in-law; the elder to Tarquin, and the younger to Aruns. The wife of Aruns murdered her own husband to unite herself to Tarquin, who had assassinated his wife. Servius was murdered by Tarquin, and his own daughter Tullia ordered her chariot to be driven over the mangled body of her father (534 B. C.).

Sesame, an annual herbaceous plant of the genus *Sesamum*, natural order *Bignoniaceæ*, sub-order *Pedaliaceæ* a sub-order characterized by wingless seeds, and placentæ with woody lobes attached to the inner wall of the fruit. The calyx of sesamum is

five-parted; the corolla irregular five-parted; the stamens four, two longer than the others, and a rudimentary fifth stamen; the capsule is oblong, almost four-celled, two-valved, many-seeded. The species most noteworthy of notice is *S. indicum*, sometimes identified with and sometimes distinguished from *S. orientale*, a native of India. Sesame is cultivated throughout the East from Egypt to Japan for the sake of the seeds, which yield by expression gingili oil. The oil is used in cookery — as a substitute for butter in the same way as olive oil — for lighting, and for the purposes of lubrication. It is inodorous, has a sweet taste, and keeps for years without becoming rancid. In Egypt and Arabia it is preferred to olive oil. It is used in connection with medicine. Egyptian women consider it the best of cosmetics and the most perfect preservative of the hair. Nine pounds of the seeds yield two quarts of the sweet oil. The sweet oleaginous seeds are used in some countries, as in Central Africa, for making a kind of hasty-pudding. The oil cake, mixed with honey and preserved citron, is an Oriental luxury. The leaves of sesame abound in a gummy substance, which they readily impart to water, making a rich bland mucilage, which is used in the S. parts of the United States (where it is grown a little) as a demulcent drink. Sesame is sometimes called til seed.

Sesamoid Bones, the name given to certain rounded bodies, at first cartilaginous and then bony, found in the tendons of muscles. The patella or knee cap is a sesamoid bone. Another is developed in the upper joint of the thumb, and at the corresponding joint of the great toe. These bones are said to occur most frequently in males, and in persons of robust and muscular build.

Sesbania, in botany, a genus of *Galegeæ*; shrubs or herbs, with abruptly-pinnate leaves, having many pairs of leaflets; flowers axillary, in racemes, generally yellow; and the legumes long, slender, torulose, many-seeded. *S. aculeata*, a slightly prickly annual, is cultivated in India for its fiber. The plant occurs also in tropical Africa and the West Indies. The wood of *S. ægyptiaca*, which grows also in India, is made into good charcoal, and the bark into rope. An ointment made with the seeds is applied in India to eruptions, and the bark is given internally as a stimulant and emmenagogue. The leaves are applied in the form of poultices to hydrocele and rheumatic swellings. The old *S. grandiflora* is now *Agati grandiflora*.

Seseli, in botany, the meadow saxifrage; the typical genus of *Seselinidæ*. Umbels compound, the bracts many, few, or wanting; bracteoles many; calyx teeth acute; petals obcordate, with an inflexed point. Fruit oval or oblong, with long reflexed styles; carpels dorsally compressed, with five prominent, obtuse, corky ribs, having single vittæ on the interstices. Known species about 40 from the Eastern Hemisphere. The seeds of *S. indicum* are carminatives, and are used as a medicine for cattle.

Sesha, in Hindu mythology, the king of the serpent race, on which Vishnu reclines on the primeval waters. It has 1,000 heads on one of which the world rests. The coiled-up Sesha is the emblem of eternity.

Sesostris, the most celebrated of the early kings of Egypt. According to the legend, which evidently confounds the military exploits of several monarchs, he, on succeeding to the throne, became ambitious of military fame, and marched at the head of a numerous army to make the conquest of the world. Libya, Æthiopia, Arabia, with all the islands of the Red Sea, were conquered; and the victorious monarch marched through Asia, and penetrated farther into the East than the conqueror of Darius. He also invaded Europe, defeated the Thracians, and placed columns in the several provinces he had subdued, bearing the pompous inscription, "Sesostris, the king of kings, has conquered this territory by his arms." After his return, he employed himself in encouraging the fine arts, and in improving the revenues of his kingdom. In his old age, Sesostris, having grown infirm and blind, destroyed himself. The time of Sesostris is placed from 1400 to 1250 B. C. Sesostris, so called by the Greeks, is identical with Rameses II., one of the most famous of the Pharaohs.

Sesqui, a prefix denoting one integer and a half; as, sesquicyathus a cyathus and a half. It is used: (1) in chemistry, to denote that two atoms of a metal were combined with three atoms of oxygen or other non-metallic element; as thus, sesquioxide of iron, Fe_2O_3, now called ferric oxide; sesquisulphide of iron, or ferric sulphide, Fe_2S_3, etc. This definition does not hold good unless the valency of the metal is taken into consideration. Thus sesquichloride of iron is Fe_2Cl_6, the iron being quadrivalent, while sesquichloride of antimony is $SbCl_3$; the antimony being trivalent; (2) in geometry, to express a ratio in which the greater term contains the less once, and leaves a certain aliquot part of the less one; (3) in music, to signify a whole and a half; as, sesquialtera, sesquiterza, etc.

Sessa (the ancient Suessa Aurunca), a town of Southern Italy in the province of Caserta; on the crater of an extinct volcano, and on the road from Gaeta to Capua; 16 miles N. W. of the latter. It contains the ruins of an amphitheater, and ancient medals and bronzes have been found.

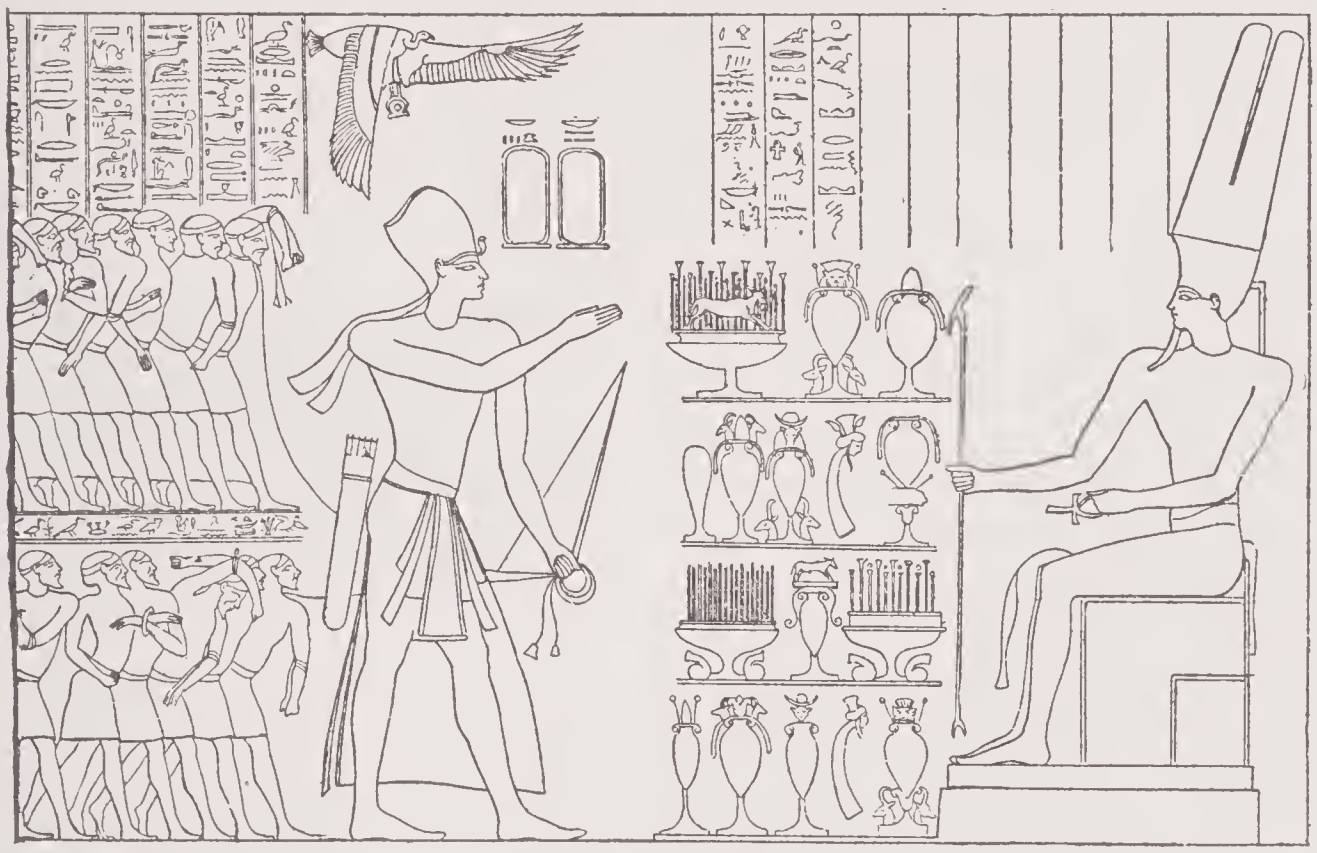
Sessile, in botany, sitting close upon the body that supports it without any sensible stalk; as, a sessile leaf, *i. e.*, one without a petiole. In zoölogy, etc., destitute of a peduncle, attached simply by a base.

Session, the sitting together of a body of individuals for the transaction of business; the sitting of a court, council, legislature, academic body, or the like, or the actual assembly of the members of such or like bodies for the transaction of business. Also the time, space or term during which a court, council, legislature, or the like meets for business, or transacts business regularly without breaking up or dissolving. The session of a judicial court is called a term. Sessions is used as the title of some courts of criminal jurisdiction in the United States and England. It is also used in several of the States as the title of a court of justices held for the purpose of granting licenses, laying out public roads, etc.

Sestetto, a musical piece for six independent instruments or voices.

Sesterce, a Roman coin, the fourth part of the *Denarius*, and thus containing at first two *asses* or *libræ*. The name is an abbreviation of the Latin *semis-tertius*, which was their mode of expressing two, and their custom was to derive the names of all their coins from the foundation of their money system, the *As*. The symbols for it were indifferently HS or IIS, the former being only a modification of the latter, which expresses two units, and S for the additional half-unit (*semis*). In the Latin classics, the phrase *sestertius-nummus*, or merely *nummus*, is frequently employed to denote this coin. When the *Denarius* was made to contain 16 *asses*, the relation between it and the sestertius was preserved and the latter from that time contained 4 *asses*, though the name, which was now no longer significant, was preserved. The sum of 1,000 sestertii was called *sestertium*, which, after Augustus, was equal to about $32, and was the "money of account" (never a "coin") used in the reckoning of large sums of money.

Setaria, in botany, bristle-grass; a genus of *Paniceæ*. Panicle spike-like; spikelets two-flowered, one to three together, surrounded by bristles; glumes two awnless. Known species 20. *S. germanica* is German millet. *S. italica*, a grain cultivated in India on the plains, and on the hills up to 6,500 feet, with two varieties, one straw-yellow and the other reddish-yellow, is largely used as a cereal in India, but is considered heating. It may have come originally from China, Japan, the Indian Archipelago or Australia.



SETHOS I. OFFERING PRISONERS AND GOLDEN VESSELS TO THE GOD AMMON RE.

Sethites, a Gnostic sect that existed in Egypt in the 2d century and bore some resemblance to that of the Ophites. They worshiped Seth, the son of Adam, as the son of God, but not of the creator of Adam and Eve, and maintained that he had reappeared in the person of Jesus Christ. They pretended to have several books written by him.

Sethos I., or **Seti,** an Egyptian monarch, the second Pharaoh of the XIX. dynasty; which lasted from 1462 B. C. to 1288 B. C. He seems to have been one of the

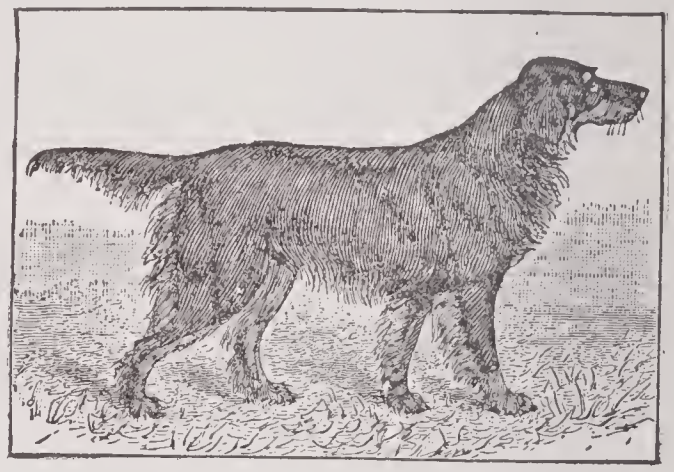
shepherd race in the E. part of Delta. He was distinguished as a builder and a warrior, erecting the temples of Osiris at Abydos, the "hall of columns" in his palaee at Karnak, and establishing the power of Egypt over Western Asia. He reigned about 30 years.

Seton, in surgery, an artificially produeed sinus or ehannel, through whieh some substance — *e. g.*, a skein of eotton or silk, or a long flat pieee of india-rubber or guttapercha — is passed so as to exeite suppuration, and to keep the artifieially formed openings patent. (The term is, however, very often employed to designate the inserted material.) Setons are established in the subeutaneous tissue of the body (1) as counter-irritants, or (2) to act as a drain on the system at large. For the purposes of eounter-irritation setons are usually inserted in the neighborhood of the affeeted parts; but when intended to aet as a drain on the system at large — *e. g.*, in threatened head affeetions — the nape of the neck is the part always seleeted. The operation is very simple. A longitudinal fold of skin over the spines of the cervieal vertebræ is raised by the fingers from the deeper struetures, and is transfixed by the seton needle rather obliquely, so that one of the openings shall be rather more dependent than the other. The needle must pass somewhat deeply through the subeutaneous tissue, as if it passed immediately beneath the skin the latter would probably slough over the whole traek of the wound. The inserted material should be smeared with oil, and may be allowed to remain undisturbed for four or five days, till there is a free diseharge of matter, after whieh a fresh portion should be drawn daily through the wound. The word seton is derived from the Latin *seta*, "a hair," beeause hairs were originally employed as the inserted material. Indeed at the present day it is the eustom of many of the nomadic tribes of central Asia to insert a hair into the heels of their prisoners, whieh lames them to such an extent as to prevent their eseape.

Seton, Elizabeth Ann, an Ameriean philanthropist; born in New York eity, Aug. 28, 1774; was the founder of the order of Sisters of Charity; established the nueleus of that soeiety at Emmetsburg, Pa., in 1809, and sent the first eolony of the Sisters to Philadelphia, Pa., and another to New York eity in 1817. At the time of her death she had established 20 eommunities of Sisters of Charity, in Pennsylvania, New York, Ohio, Delaware and other States. She died in Emmetsburg, Md., Jan. 4, 1821.

Seton-Thompson, Ernest. See THOMPSON-SETON.

Setter, a breed of dog employed in shooting, where he fills the same vocation as the pointer. The setter is divided into three varieties — the English setter, the Gordon setter, which is native to Scotland, and the Irish setter. There was also at one time a variety known as the Welsh setter, but it is now extinct, and probably never differed widely from the English setter. As early as the 16th century the then Duke of Northumberland owned a dog trained by himself to set game, an idea soon followed by others. For many years, however, the spaniel or any other suitable dog was seleeted to train to the habit of setting game; and it is not till the beginning of the 19th eentury that any reliable record of a distinet breed of setting dogs ean be found. The English setter is bred from the spaniel probably by erossing with the pointer. Though at one time setters were known of nearly all eolors, at the present time the English setter is generally white with red markings, or tieked with blaek spots known



SETTER "HEATHER GROUSE."

as a "blue Belton." The Gordon setter was founded by the Duke of Gordon about 1800, by erossing the existing setter with a collie biteh whieh had been trained to set. The Gordon was originally a blaek, tan, and white dog, though white has gradually disappeared from the breed. The Gordon setter should now be a rieh and glossy black marked with tan on face, chest, and legs, The origin of the Irish setter is unknown, and it is hard to say where the peeuliar blood-red color was obtained. In conformation the three varieties differ very slightly, though the Irish setter is a lighter and more leggy dog than the others. The setter should be a smart and aetive dog, not built on too heavy a scale; ehest very deep, though not wide; shoulders sloping baek; and with good strong legs and feet. Each variety of the setter has its admirers, and it is an undeeided question which is the best, or if any of them are superior to the pointer. Though the setter ean endure mueh more fatigue and hard weather than the pointer, yet he is more headstrong and requires repeated breaking. The Irish setter is the ehief sinner in this respeet, but is a splendid dog when properly broken.

Settlement, in ecclesiology, a sum of money or other property granted to a clergyman on his ordination, exclusive of his salary; or, a homestead of a pastor, as furnished sometimes by donation of land with or without buildings, sometimes by the pastor's applying funds granted for the purpose. In law, the act of settling property upon a person or persons; a deed by which property is settled; the general will or disposition by which a person regulates the disposal of his property, usually through the medium of trustees, and for the benefit of a wife, children, or other relatives; disposition of property at marriage in favor of a wife; jointure.

Settlement, Act of, in English history, an act passed in 1702, by which the succession of the crown was settled on the death of Queen Anne on Sophia, granddaughter of James I., and wife of the Elector of Hanover, and the heirs of her body, being Protestants.

Settle, Elkanah, an English playwright and poet; born in Dunstable, England, in 1648. His chief plays are: "The Empress of Morocco" (1673); "Love and Revenge" (1675); "Pastor Fido, or the Faithful Shepherd" (1677), after Guarini; "The Female Prelate; or, The Life and Death of Pope Joan" (1680); "Distressed Innocence; or, The Princess of Persia" (1682). He died in London, in 1723.

Setubal, or **St. Ubes,** a seaport of Portugal; on the N. side of the Bay of Setubal; 17 miles S. E. of Lisbon. The harbor is protected by five forts. The town owes its importance chiefly to its trade in wine, sea-salt, and oranges, though fishing is carried on with considerable activity. Setubal is the old Roman Cetobriga. In 1755 it suffered severely from the earthquake that devastated Lisbon. Pilgrimages are made to the monastery of Arrabida, with its neighboring stalactite cave. The poet Bocage was born in Setubal.

Seven Churches of Asia, The, the churches of Ephesus, Smyrna, Pergamos, Thyatira, Sardis, Philadelphia, and Laodicea (Rev. i: 11).

Seven Cities, The, Egypt, Jerusalem, Babylon, Athens, Rome, Constantinople, and either London or Paris. They are often grouped under this title, as embodying wealth, antiquity, greatness, and magnificence.

Seven-Day Fever. See Relapsing Fever.

Seven Deadly Sins, Pride, Covetousness, Lust, Gluttony, Anger, Envy, Sloth.

Seven Gifts of the Holy Ghost, Wisdom, Understanding, Counsel, Fortitude, Knowledge, Piety, and the Fear of the Lord (Isa. xi: 2).

Seven-Hilled City, Rome, the ancient capital of Italy. At the time of its founding its site embraced seven considerable eminences, most of which, however, have been so abraded in the lapse of ages as to be now scarcely recognizable.

Seven Hills of Rome, the hills on which Rome was originally built. They were the Capitoline, Palatine, Aventine, Quirinal, Viminal, Esquiline, and Cœlian.

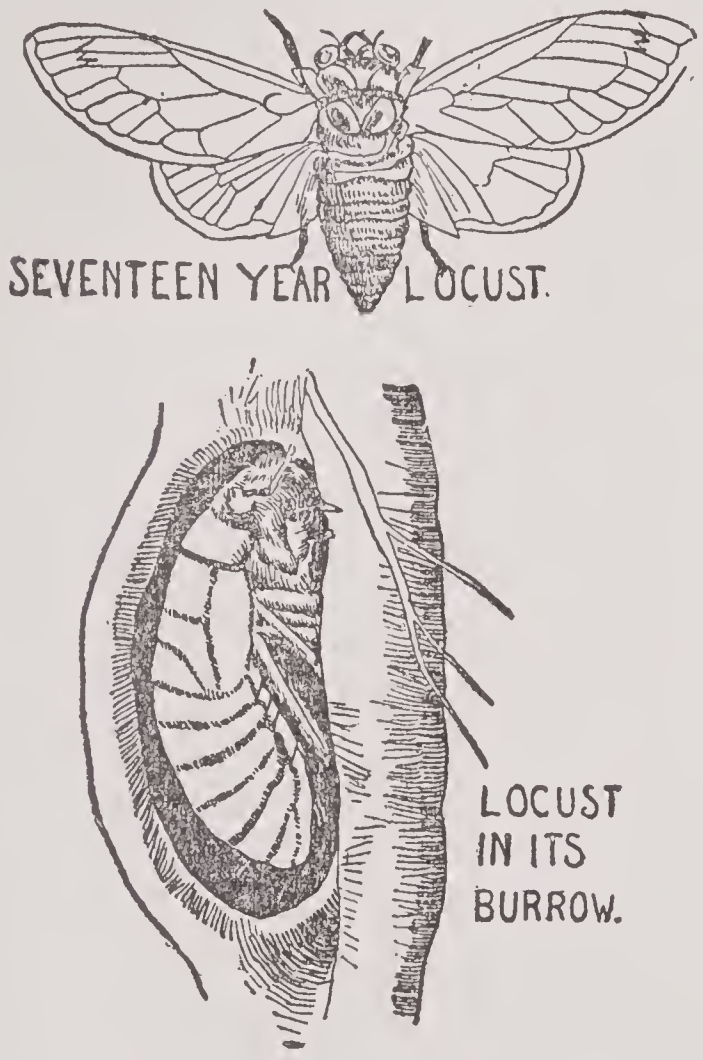
Seven Pines, the name of a locality in Virginia, 6 miles from Richmond, where, May 31, 1862, the Confederates, commanded by Generals Longstreet and Stuart, defeated the Nationals under General Casey. The battle received its name from seven solitary pine trees at the spot where the fiercest fighting took place. This battle may be considered as the beginning of the battle of Fair Oaks.

Seven Principal Virtues, Faith Hope, Charity, Prudence, Justice, Fortitude, Temperance. The first three are called also Theological Virtues, the other four are known as the Cardinal Virtues.

Seven Sages. See Sages of Greece, Seven.

Seven Sleepers, the heroes of a celebrated legend, which is first related in the West by Gregory of Tours in the close of the 6th century, but the date of which is assigned to the 3d century, and to the persecution of the Christians under Decius. According to the story, during the flight of the Christians from the persecution, seven Christians of Ephesus took refuge in a cave near the city, where they were discovered by their pursuers, who walled up the entrance in order to starve them to death. They fell instead into a preternatural sleep, in which they lay for nearly 200 years. This is supposed to have taken place in 250 or 251; and it was not till the reign of Theodosius II. (447) that they awoke. They imagined that their sleep had been but of a single night; and one of the seven went secretly into the city to purchase provisions, and he was amazed to see the cross erected on the churches and other buildings. Offering a coin of Decius in a baker's shop he was arrested, his startling story not being believed till he guided the citizens to the cavern where he had left his comrades. The emperor heard from their lips enough to convince him of the life beyond the grave, whereupon they sank again to sleep till the resurrection. Gregory explains that his story is of Syrian origin — it is widely current in the East, and was adopted by Mohammed, who even admits their dog Kitmer also into Paradise. The Roman Catholic Church holds their festival on June 27. The names usually given are Maximianus, Malchus, Martinianus, Dionysius, Joannes, Serapion and Constantius. Paulus.

Diaconus (8th century) locates a similar story in Germany, and Rydberg makes out a good case that the myth is of Teutonic origin intimately connected with the return of the dead Balder and of the other dead men from the lower world, with the idea of resurrection and the regeneration of the world, but possibly enough first Christianized in Syria or Asia Minor. The seven sons of Mimer awakening from their long sleep at the blast of Heimdal's trumpet to take their part in the final struggle of the universe is a close parallel to the seven saints of Ephesus. Both in Germany and Sweden the seven sleepers are connected with the weather — if it rains on their day rain will follow for seven weeks together. They



are supposed also to take especial care of sailors.

Seven Sorrows of the Virgin, Feast of, a Roman Catholic festival, instituted in 1725 by Pope Benedict XIII., and celebrated on the Friday before Palm Sunday. The seven sorrows commemorated by this feast are: (1) the prediction of Simeon (Luke ii: 34, 35); (2) the flight into Egypt; (3) the loss of Jesus in Jerusalem; (4) the sight of Jesus bearing his cross; (5) the sight of Jesus on the cross; (6) the piercing of the side of Jesus; (7) the burial of Jesus.

Seven Stars, the PLEIADES (*q. v.*).

Seventeen-Year Locust, the *Cicada septendecim*. There is no insect known to science which affords such an interesting study as does the seventeen-year locust. He begins and ends life in the bright sunshine, but spends 17 years in the dark, cold earth — more than two years in darkness for every week in light. He is of a verity the "enemy that worketh in darkness." Safely hidden from sight he gnaws away at the roots of trees, does his best to kill them, and then, emerging into the light, completes the death dealing operation by making as vicious an attack on the branches as was made on the roots. He is of a coal-black color, marked with bright orange yellow, and there is a white spot on the head just behind the eyes. There are four glassy wings, and the eyes are red. The locust's length is from one and one-half to one and three-quarters inches, and with its wings spread its breadth is from two and one-half to three and one-quarter inches.

Its habits and life history in some respects almost pass belief. When the insect emerges from the ground after its 17 years' burial it works its body rapidly backward and forward like a man trying to put on an extremely tight coat. The result of the movement is the breaking of the shell which covers the creature and the immediate appearance of its wings. The remarkable power of instinct is shown as soon as the insect is freed of its enveloping armor. It makes instantly for the nearest tree. The locusts pair at once. They then congregate on the branches of the trees in sufficient

numbers to bend and at times break them by their weight. The woods and orchards resound with the din of the drums from morning to night. The old belief that the females sawed off the branches in which they had laid their eggs can readily be accounted for. They have actually a small pair of saw-shaped instruments with which they detach little splinters of wood to cover the perforations made in the branches where the eggs are laid.

The females prepare the nest by clasping a branch of moderate size and perforating it with holes by means of an awl-shaped piercing instrument with which they are provided. They repeatedly thrust this piercer obliquely into the bark and wood in the direction of the fibers, at the same time putting in motion the lateral saws which detach little splinters of wood and make a fibrous lid over the whole. In each fissure made by the piercer the female deposits from 10 to 20 eggs in pairs. It takes her a quarter of an hour to prepare one nest and fill it with eggs and she usually makes between 15 to 20 fissures in one limb. She lays between 400 and 500 eggs and then soon dies.

The perforations made by the females in the limbs cause their death, and that orchard which receives a visit from the seventeen-year locusts soon stands a brown and blasted ruin. Six weeks after the eggs are laid they hatch. The young when it bursts the shell is one-sixteenth of an inch long and is of a yellowish white color except the eyes and the fore claws, which are reddish. It is grublike in form and has six legs, the first pair of which are large and are shaped like lobster claws, having strong spines beneath. On the shoulders, where 17 years later the wings appear, are little protuberances and directly under the breast is a long beak for suction. After being hatched the young locusts deliberately loosen their hold on the limb and fall to the earth. They instantly dig their way into the ground where they seek out the tender roots of plants and trees. These they cut with their beaks and draw out the vegetable juices which constitute their sole nourishment — and thus it is for 17 long years.

The drums of the male locusts, on which they perform during their short lives above ground, are formed of convex pieces of parchment gathered into numerous fine plaits and are lodged in cavities behind the thorax. The insects play on these drums by the means of muscles which contract and relax with great rapidity. One has to hear a concert of the seventeen-year locust to realize the numerical strength of the chorus and its tremenduous volume of sound. Writing in 1633 a Massachusetts Puritan said of the locusts and their noise: "They came out of little holes in the ground, and did eat up the green things, and made such a constant yelling noise as made the woods ring of them and ready to deafen the hearers."

People in different localities who know when the last visitation of locusts occurred may by a little calculation know when they are to come again. The Agricultural Department says that no young trees should be set out for a year or two prior to their visit. The older trees are frequently able by their strength to live through the attacks. Extremely valuable shrubs and trees may be saved by being completely covered with mosquito netting, thus preventing the deposit of eggs, but this means of protection is too costly in time and money for general use.

Seventh-Day Baptists, a body of Christians who assumed their present denominational forms as "Sabbatarian Baptists" in England, during the English Reformation. Their distinctive doctrines were first preached by John the Baptist. Sabbath-keeping, as obedience to God's law, and baptism, as the symbol of a new life after repentance, are fundamental facts in the early history of Christianity. In these facts Seventh-day Baptists find the warrant for their denominational existence. On these points they claim to be identical with the New Testament Church.

History.— There is no positive evidence of any form of observance of Sunday by Christians previous to the middle of the 2d century. Sabbath-keeping continued even in the Western Church as late as the 5th century, and in the Eastern till the 15th, or later. Since Sabbath-keepers denied the authority of the Church, they were persecuted as most obnoxious heretics by the papal powers. Their earlier history, coming through the hands of these enemies, has been wholly destroyed or much distorted. When the Western Church drifted into the papacy these dissenters were first known as Nazarenes, Cerinthians, and Hypsistarii, and were stigmatized as "Judaizers." Later they were known as Vaudois, Catharii, Toulousians, Petrobrusians, Passagii, and Waldenses. These were not wholly uniform in doctrine and practice, but they were Sabbath-keeping Baptists, who accepted the Bible alone as authority. They form the irregular but never wholly broken chain between the New Testament Church and the modern Seventh-day Baptists. Sabbath-keepers in the Eastern Church were not disturbed by the papal power, and were far more numerous. When the Romish Church attempted to proselyte the Abyssinians in the 17th century, they found them observing the Sabbath and ready to take up arms in its defense. They "had hallowed it from time immemorial." The Armenian Church

was founded as early as A. D. 302; from that time till English missionaries entered Armenia early in the 19th century Sabbath-keeping continued without interruption. The Nestorian or Chaldean Christians have also continued their original practice of Sabbath-keeping to the 19th century; and there is every reason for believing that the Sabbath is still kept in these three branches of the Church, except where modern missionary work may have modified or set it aside. These facts are of great moment as showing what the earliest practice was, and what it has continued to be, where the Papal Church has not had power to repress it.

When the darkness of the Middle Ages began to recede before the light of the Reformation scattered Sabbath-keepers were found whose history linked with those who had died for their faith and their fealty to the law of God during that midnight of history. Sabbath-keepers increased as the spirit of reform spread among the people. At first they were more prominent in Bohemia, Transylvania, and Holland. During the Reformation in England Sabbath-keepers were among the representative men of the times. Their writings and sufferings form an interesting factor of the history of those years. John Trask, William Hillyard, Christopher Sands, Rev. Mr. Wright, and one Hebden, were among those who were prominent between 1600 and 1630. About 1630 Theophilus Brabourne wrote several books in favor of the Sabbath, and with such effect that the king ordered Bishop Francis White to answer him; the answer was published in 1635. Among the writers who succeeded Brabourne were James Ockford, Edward Fisher, Edward Stennett, Francis Bampfield, Thomas Bampfield, Joseph Stennett, and Samuel Sennett, D. D. The influence of the Seventh-day Baptists was a prominent factor in forcing the Puritan party to adopt the "change of day" theory which gave birth to the "Puritan Sunday." Afraid to remain on the no-Sabbath platform of the Church party, and of the Continental Reformers, and not radical enough to accept the Sabbath doctrines of the Seventh-day Baptists, the Puritans sought this middle ground of compromise. This theory was first published by Nicholas Bound, of Norfolk, England, 1595–1602. A number of Seventh-day Baptist Churches were organized in England between 1600 and 1700. Three were in the city of London. The one at Mill yard, 15 Leman Street, is still flourishing, holding regular Sabbath services. This congregation was first gathered by Rev. John James, date unknown from loss of records. On Oct. 19, 1661, Mr. James was arrested in his pulpit, tried, and condemned on the false charge of "treason," a proceeding not uncommon in those days in order to get rid of men whose religious and reformatory views could not be answered otherwise. He was "hung, drawn, and quartered." "After he was dead his heart was taken out and burned, his quarters were affixed to the gates of the city, and his head was set up in Whitechapel, on a pole opposite the alley in which his meeting-house stood."

Churches in the United States.— These were the result of emigration from England. Stephen Mumford, of London, came to Newport, R. I., in 1664. He united with the Baptist Church, though a Sabbath-keeper. Others embraced the Sabbath, and the first Seventh-day Baptist Church in America was organized at Newport in 1671. A second branch was founded by Rev. Abel Noble, near Philadelphia, about 1700. A third was founded in Northern New Jersey by converts from the Piscataway Baptist Church in 1705. From these three points the denomination has spread slowly W. and S., as shown by statistics. In 1818 the General Conference adopted Seventh-day Baptists, instead of Sabbatarian, as the denominational title. In 1910 there were reported 96 churches; 82 ministers, 8,239 members.

Seventh-Day German Baptists, an offshoot from the Dunkers, in Germany, about 1728. Conrad Beissel, the founder, published a tract against the observance of the first day, and retired to a cave on the banks of the river Cocalico, unknown to the people he had left. In 1732 the solitary life was changed to a conventual one, and the next year a monastic society was founded, bearing the name Ephrata. The habit of the Capuchins was adopted by both brethren and sisters. There were neither vows nor written covenant, but the property was common stock. Celibacy was recommended, but not required. Branches were established in York and Bedford cos., Pa., in 1763. Their principal settlement is Snow Hill, Franklin Co., Pa.

Seven-Up, a game of cards, sometimes called "all fours" from the four points (high, low, jack and game) that are at stake.

Seven Weeks' War, the great conflict in 1866 for German supremacy between Prussia and Italy on one side and Austria on the other, in which the allies were victorious.

Seven Wise Masters, the most common title given to a famous mediæval collection of stories, grouped round a central story, the history of which is almost the most important among the problems of storiology. The leading story itself is briefly as follows: A young prince is born in answer to prayer as the only son of the aged King

Kûrush, and the astrologers foretell a great danger overhanging his fate at 20. At seven years he is entrusted to masters, but at 13 he has not learned anything. The sages then recommend Sindibâd as the best master, but for six and a half more years the young prince studies under him uselessly, and at 19½ he has still learnt nothing. The king again assembles the wise men, and Sindibâd offers to teach the prince everything in six months or forfeit his life. He now shuts himself up with his pupil, who this time succeeds to his master's satisfaction. Before bringing him back Sindibâd consults the stars, and sees that the prince will die if he should speak before seven days. Sindibâd therefore hides himself, and the prince at court is found to be dumb. One of the king's women now tempts him as the wife of Potiphar did Joseph, and in the fury of disappointed rage accuses him to the king of an attempt on her virtue. The king condemns him to death, whereupon the seven viziers resolve to intercede to stay his execution. The first goes to the king, and by two tales against women obtains the suspension of the execution for that day. Next day the woman by a tale of contrary character obtains a confirmation of the sentence; but a second vizier again procures a suspension by two tales; and so on till the end of the seventh day when the prince is free to speak. He now comes to the king attended by the sages and by Sindibâd, whereupon the woman is duly punished, and the king, after seeing proof of his son's wisdom, gives him his throne and retires into solitude to serve God.

Of variant versions there are two principal groups, the Eastern and the Western, the first including all the texts in Eastern languages, and some more or less free translations from Oriental texts; the other including the "Dolopathos," the "Historia Septem Sapientum," the "Erasto," and many others. The Oriental texts have so many elements in common that they obviously spring from one book as a common basis of which they are more or less faithful translations, at different epochs and in different literatures. The Western texts, though derivable from the Eastern, show great divergences alike in the fundamental story and in the tales inserted in it. The real cause of this is that in the Western cases oral tradition has transmuted the contents.

The earliest version of a "Book of Sindibâd" is found in Arabian writers of the 10th century. The more important Eastern versions are the following: (1) The "Syntipas," a Greek text translated from the Syriac by Michael Andreopulos during the last years of the 11th century (ed. by Dr. A. Eberhard in vol. i. of "Fabulæ Romanenses Græce Conscriptæ" 1872). A Syriac text was found by Rödiger, and has been edited, with a German translation, by Dr. Baethgen (1879). (2) The Hebrew version entitled "Parables of Sandabar" ("Mischle Sandabar"), translated from the Arabic, probably in the first half of the 13th century. There is a German translation by Sengelman (1842), a French by Carmoly (1849). (3) the "Sindibâd-Nâmeh" an unedited Persian poem, written in 1375. (4) The eighth night of the "Tûtî-nâmeh" of Nachschebî, a Persian poet who died in 1329. Of this there is a German translation by Professor Brockhaus (1845.) (5) "The Seven Viziers," an Arabic text, forming part of some redactions of the "Thousand and One Nights," of uncertain age, but not ancient. (6) An ancient Spanish translation of an Arabic text existing in a 15th-century codex — the version closest to the "Syntipas." It was first printed by Comparetti in his "Ricerche intorno al Libro di Sindibâd" (1869).

Seven Wise Men. See Sages of Greece, Seven.

Seven Wonders of the World, in ancient times, the Pyramids of Egypt, the Hanging Gardens of Semiramis at Babylon, the Temple of Diana at Ephesus, the Statue of Jupiter at Athens by Phidias, the Mausoleum, the Colossus at Rhodes, and the Pharos of Alexandria. This cycle of seven wonders originated among the Greeks after the time of Alexander the Great, and they were described in a special work by Philo of Byzantium.

Seven Years' War, a famous European war which lasted from 1756 to 1763. As the result of a war with Prussia (*q. v.*) Maria Theresa of Austria had to cede Silesia to Frederick the Great. With a view to recover her lost territory she concluded an alliance with Russia, secured the support of Poland and Saxony, and attempted to form a closer union with France. In the meantime war broke out between France and England (1755), and George II., in order to protect his German states, concluded an alliance with Prussia, while France agreed to aid Austria against Frederick. Being informed of these negotiations Frederick resolved to anticipate his enemies. In August, 1756, he invaded Saxony, occupied the chief towns, and compelled the Saxon army to surrender. This step created a stir in the European courts, and in 1757 Austria, Russia, France, Sweden, and the German empire were in arms against Frederick, while he had no ally but England and a few German states. In 1757 Frederick marched into Bohemia and gained a bloody battle at Prague (May 6). Soon after, however, the Austrians under Daun defeated Frederick at Kollin (June 18), relieved Prague, and forced the Prussians to retreat to Saxony and Lusatia.

The French army, after defeating Frederick's German allies (under the Duke of Cumberland) at Hastenbeck, united with the imperial forces; Frederick met them at Rossbach and routed both armies on Nov. 5. He then hurried back to Silesia, which was occupied by the Austrians, and vanquished a superior army under Daun at Leuthen (Dec. 5), thus recovering Silesia. While Frederick was thus occupied in the S. and W., his general Lehwald had successfully repelled the Swedes and Russians on the N. and E.

The next campaign was opened in February, 1758, by Ferdinand, Duke of Brunswick, who, at the head of Frederick's allies, opposed the French in Lower Saxony and Westphalia. He defeated the French at Krefeld in June, and ultimately drove the enemy behind the Rhine. Frederick, driven out of Moravia, defeated the Russians, who had advanced to Zorndorf, in Brandenburg, was defeated in turn by Daun at Hofkirchen, but before the end of the year drove the Austrians from Silesia and Saxony. Louis XV. and his mistress, the Marchioness de Pompadour, were bent on continuing the war, and concluded a new alliance with Austria, Dec. 30, 1758. Frederick, however, had also obtained a new treaty with Great Britain, which promised him a large yearly subsidy. The new campaign was opened in March, 1759, Prince Henry, Frederick's brother, marching into Bohemia, where he dispersed the hostile forces, and captured immense quantities of military stores. The Russians, having defeated the Prussian general Wedel near Züllichau (July 23), advanced to Frankfort-on-the-Oder. Frederick hastened to meet them in person, and had already defeated them at Kunersdorf (Aug. 12) when his victory was snatched from him by the Austrians under Laudon, who inflicted on him a defeat such as he had never sustained before, Frederick's position was now extremely precarious. The Russians were victorious in his hereditary states, Daun was in Lusatia with a large army, and Saxony was overrun by the imperial troops. In the W. Frederick's allies had been more successful. On Aug. 1 Ferdinand gained a splendid victory at Minden over the French troops under Contades and Broglio. On the same day his nephew defeated the French at Gohfeld, and they were driven over the Lahn on one side and over the Rhine on the other. The Swedes, also, who, after the battle of Kunersdorf invaded Prussian Pomerania, were driven by Manteuffel and Platen under the cannon of Stralsund. The campaign of 1760 seemed at first to forebode ill success to Frederick. While he himself was engaged in Saxony Fouqué suffered a defeat in Silesia, in consequence of which the Austrians occupied the whole country. Frederick thereupon gave up Saxony in order to recover Silesia. On Aug. 15 he defeated Laudon at Liegnitz, by which he effected his purpose of recovering Silesia. He then returned to Saxony and attacked the imperial forces at Torgau, on the Elbe (Nov. 3), defeated them in a bloody engagement and went into winter quarters in Saxony. The Russians also were forced to retire to Poland, and Ferdinand defeated the French at Marburg (July 31).

In the campaign of 1761 the operations of Ferdinand of Brunswick and the French on the Rhine consisted of alternate advances and retreats, and the Russians and Austrians were so enfeebled that they failed to make any impression on Frederick's remnant of an army. In the campaign of 1762 the French were defeated (June 24) at Wilhelmsthal, and Cassel surrendered to the allies on Nov. 1. Two days after this the preliminaries of peace between Great Britain and France were signed, and the peace itself was confirmed at Paris, Feb. 10, 1763. After a short negotiation Frederick concluded a peace with Austria and Saxony at Hubertsburg (Feb. 15), by which he retained Silesia. The war in Europe was accompanied by war by sea and land between the French and British abroad, the result of which was to give Great Britain a decided superiority over France both in America and India.

Severn, the second largest river in England, formed by the union of two small streams which rise in Mount Plinlimmon, Montgomeryshire. It flows through Montgomeryshire, Shropshire, Worcestershire, and Gloucestershire, passing the towns of Newton, Welshpool, Shrewsbury, Worcester, Tewkesbury, Gloucester, and Bristol, and after a circuitous S. course of about 210 miles falls into the Bristol Channel. It receives the Tern, Upper Avon, and Lower Avon on the left, and the Teme and Wye on the right. Its basin has an area of 8,580 square miles. It is navigable to Welshpool, about 178 miles above its mouth and 225 feet above sea-level. Below Gloucester its navigation is much impeded, but this has been obviated by a canal from this city to a point on the estuary 2 miles from Berkeley, capable of carrying vessels of 350 tons. Below Gloucester the banks become so low that destructive inundations have not infrequently occurred. These have been partly caused by one of the most remarkable features of the river, its bore, or by the height of the tides, which at the mouth of the Avon sometimes exceed 48 feet, and at Chepstow attain even 60 feet. A railway tunnel 4½ miles long has been driven below the river from near Avonmouth, in Gloucestershire, across to Monmouthshire, and a railway bridge 3,581 feet long crosses the river at Sharpness higher up.

Severo, Cape. See CHELYUSKIN, CAPE.

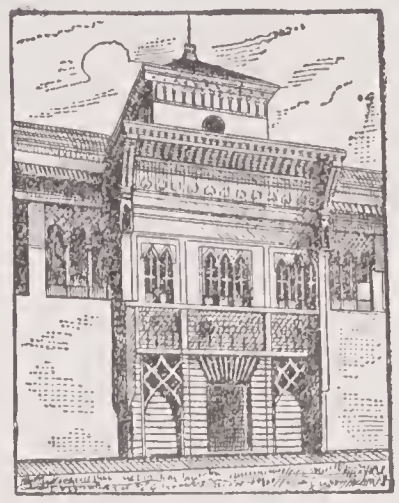
Severus, Alexander. See ALEXANDER SEVERUS.

Severus, Lucius Septimius, a Roman emperor; born near Leptis Magna, on the coast of Africa, April 4, 146. After holding the highest offices under Marcus Aurelius and Commodus, he obtained command of the legions in Gaul, and when in 193 news came of the murder of Pertinax, he was proclaimed emperor and immediately marched on Rome. Julianus, to whom the prætorian guard had sold the imperial purple, was deposed and executed. Meanwhile the Roman legions in Asia had proclaimed their general, Pescennius Niger, emperor. Severus overthrew him at Issus in 194. After a successful campaign against the Parthians, he returned to Rome, but was soon engaged in a struggle with another rival, Clodius Albinus, whom he conquered at Lugdunum in 197. New campaigns in the E. were ended by the capture of Ctesiphon, the Parthian capital. Severus then spent several years (202–208) at Rome, gratifying the people by his magnificence, and distributing large donations to the troops. In 208, he hastened to Britain to quell a rebellion there; but after an undecisive campaign, and just as he was planning a new attack on the Caledonians, he died in Eboracum (York), Feb. 4, 211.

Severus, Wall of, the name given to the wall or barrier formed at the boundary of the Roman empire in Britain between the Solway and the Tyne by the Roman emperor Severus about A. D. 210, following the line of a similar structure made in the reign of Hadrian (A. D. 120), and usually called Hadrian's Wall. It was more than 70 miles long; on the N. toward Scotland was a great ditch, on the S. edge of this was a stone wall varying from 6 to 9 feet in breadth and about 16 feet high, with towers between 50 and 60 feet square at intervals of about a Roman mile. S. of this was an earthen rampart, then a second ditch, backed by two minor earthen ramparts. At larger intervals were the stations or barracks. Remains of it are still to be seen over long ranges of country.

Sévigné, Marie de Rabutin-Chantal, Marquise de (sāv-ēn-yā′), a French letter-writer; born in Paris, France, Feb. 6, 1626. Left an orphan young, she was reared by a maternal uncle, receiving an excellent education and having access to the court. In 1644 she married Henri, Marquis de Sévigné, who fell in a duel in 1651. It was to her daughter, Mme. de Grignan, that she wrote her letters, which are of value both from an historical point of view and for their charm of style. The best edition is that in 10 volumes, 1818–1819. She died in the Castle of Grignan, Dauphiny, April 18, 1696.

Seville (Spanish, Sevilla), a famous city of Spain; capital of the province of the same name; on the left bank of the Guadalquivir, 80 miles from its mouth, and 353¾ miles S. S. W. of Madrid. The river is crossed by a fine iron bridge connecting Seville with Triana (the gipsy quarter), one of its suburbs. The city proper, which is surrounded by old Moorish walls, 5 miles in circumference, with 66 towers and 15 gates, contains a labyrinth of narrow crooked streets. The houses are mostly built in the Moorish style, and are seldom more than two stories high, with flat roofs, and an inner square court surrounded with colonnades and adorned with flowers and fountains. The windows generally look into this court; to the street there is most frequently only a balcony. The city has many fine promenades, of which the most frequented are the Alameda Vieja, El Paseo de Christina and Las Delicias. Of its 111 squares, the largest are Plaza de San Francisco, Plaza de la Encarnacion, Plaza del Duque, and the Quemadero — the scene of the *autos-da-fe;* while of its numerous streets, the chief are Calle de la Sierpe and Calle Francos. Most of the more notable public edifices are at the S. extremity near the river, and within a short distance from each other. Here are the Cathedral (Santa Maria de la Sede), the Giralda, the Alcazar, the Lonja, and (outside the wall), the royal Fabrica de Tabacos.



SEVILLE: THE ALCAZAR.

The Cathedral (1401–1519), on the site of the grand mosque of the Moors, is one of the most imposing Gothic edifices in Europe. It is 431 feet long, 315 feet wide, 145 feet high under the transept dome, has seven aisles, 93 windows, several of which are beautifully painted, and an organ with 5,400 pipes. It contains the "Biblioteca Columbiana" of 20,000 volumes, bequeathed by Ferdinand Columbus, and is rich in paintings by Murillo, Campaña, the Herreras, and other masters of the school of Seville. The Giralda is a square Moorish steeple, consisting of three towers with galleries and balconies, 350 feet high, the ascent of which is by a spiral inclined plane. On the top is a bronze statue of Faith, 14 feet high, and weighing 2,800 pounds, which yet turns like a weathercock. The Alcazar was the ancient Moorish palace. Some parts of its interior are as fine as the Alhambra. The Lonja, or Exchange,

is a square building, each side 100 feet long, in which all the American archives

1757. Other buildings are the Torre del Oro, a 12-sided tower on the river, so

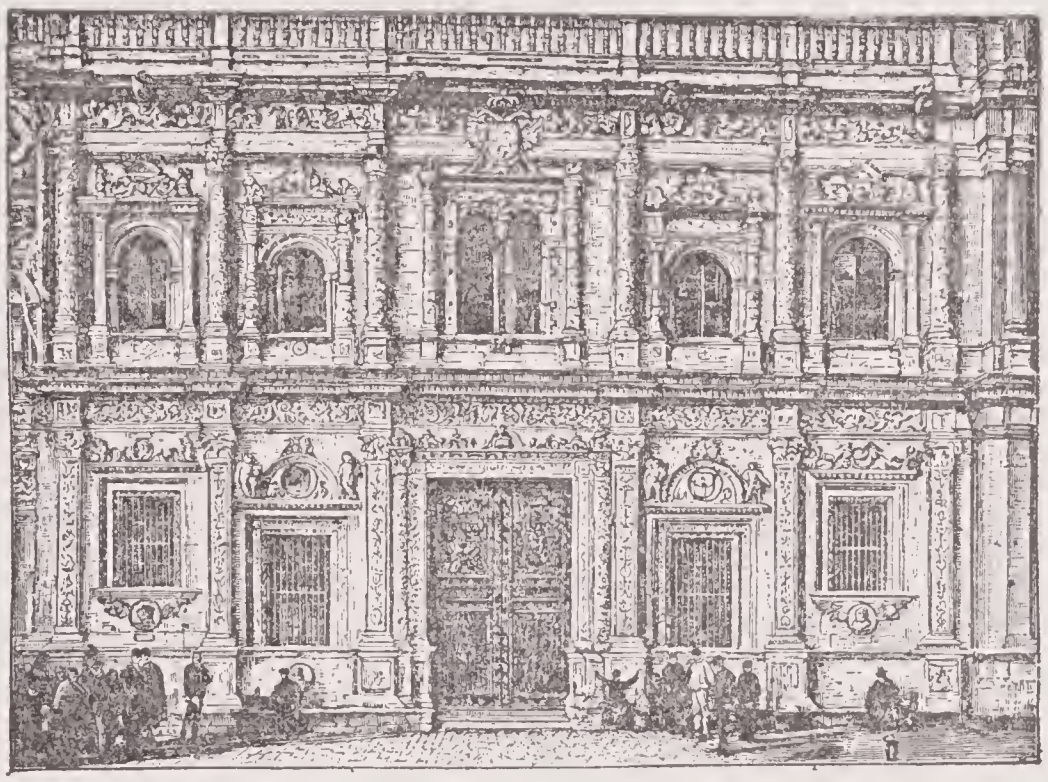
SEVILLE: GIRALDA TOWER.

are preserved. The Fabrica de Tabacos, or tobacco factory, in which several thousand persons are employed, was erected in

called from its having received the cargoes of the American treasure ships; the palace San Telmo, built by Ferdinand Columbus,

afterward owned by the Duke of Montpensier; Casa de Ayuntamiento (town house), a fine old Moorish structure; the Casa de Pilatos, or palace of the Dukes of Alcala; the Museo, rich in paintings by Murillo, Zurbaran, Torrigiano, Roelas, and the elder Herrera; and the great amphitheater, capable of accommodating, as a Plaza de Toros, 18,000 people.

One of the greatest monuments of antiquity is the Caños de Carmona, an aqueduct on 410 high arches, which conveys water from Alcala de Guadaira. It was built by the Romans and repaired by the Moors. Seville has a university, founded 1504, with a library of more than 20,000 volumes; 12 picture galleries (including the Museo), two theaters, several upper schools and learned societies. The city is visited by large numbers of strangers during the Santa Semana ("holy week"), which commences about the middle of April. Seville was formerly the emporium of commerce between Spain and her American possessions. It declined, however, as Cadiz rose into importance, but it is still a place of considerable trade, and has a great export of oranges, and large manufactures of tobacco, hardware, porcelain, and silk. Pop. (1900) 148,315.



SEVILLE: FAÇADE OF THE CITY HALL.

Seville was the Hispalis of the Romans, in whose time it was a place of great commercial importance. Under the Vandals and Visigoths it became the capital of Southern Spain. Within its walls were held the Concilia Hispalensia, 590 and 619. In the 8th century, it fell into the hands of the Moors, by whom it was called Ischbilia, and made the capital of a caliphate. It now became the most flourishing city in the peninsula, having a population of 400,000. In 1248 it was taken, after a siege of 18 months, by Ferdinand III. of Castile, and has ever since remained in the hands of the Christians.

Sèvre (sāvr), the name of two rivers in France. The Sèvre Nantaise rises in the department of Deux-Sèvres, and flows into the Loire opposite Nantes after a course of 86 miles. The Sèvres Niortaise rises 31 miles more to the S. E., in the same department, and flows into the Atlantic 10 miles N. of La Rochelle after a course of 89 miles. The department of Deux-Sèvres takes its name from these two rivers.

Sèvres, Deux ("two Sèvres"), a department in France, bounded by Maine-et-Loire, Vienne, Charente, Charente-Inférieure, and Vendée; area, 2,317 square miles; pop. (1906) 339,466. A branch of the Cévennes traverses the department from S. E. to N. W. Cereals, leguminous crops, and hops are grown. The vine, though extensively cultivated, yields only an inferior wine. The forests are chiefly of hard wood. The minerals include iron, millstones, pavement, and limestone in abundance. The principal manufactures are linen and cotton goods, serge, flannel, woolen hosiery, and gloves. Capital, Niort.

Sewage, the matter which passes through the drains, conduits, or sewers leading away from human habitations singly, or from houses collected into villages, towns, and cities. It is made up of excreted matter, solid and liquid, the water necessary to carry such away, and the waste water of domestic operations; but to these are added the liquid waste products of manufacturing operations, and generally much of the surface drainage water of the area in which the conveying sewers are situated. While human beings live in a nomadic or rural state, the treatment of excreta and other waste materials presents little difficulty; but as soon as communities form, the removal of sewage becomes a question of the most vital concern; and in proportion to the population both the necessity and the difficulty of adequately disposing of such matter are increased.

There can be no doubt that the pestilence and plagues which at frequent intervals devastated ancient and mediæval cities were

Sewage

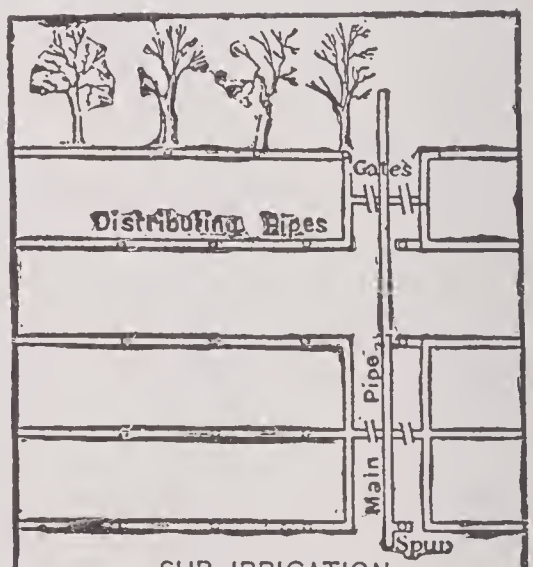
almost invariably caused, and always intensified, by the entire absence of any system for treating or removing excreta and other decaying organic matter; and even yet, notwithstanding the assiduous regard paid to sanitary science in most well-governed towns, many diseases are directly traceable to the noxious influence of decomposing sewage matter. The dense packing of human beings in modern towns, and the concentration of manufactures in such centers, have enormously increased the magnitude and importance of the sewage question; and it is not too much to say that the efficient and economical treatment of towns' sewage is the greatest and most urgent social problem of our times.

The question presents itself in a twofold aspect: (1) the necessity for the prompt and complete removal of sewage from the neighborhood of human dwellings, and its disposal in a way the least offensive and injurious to health; (2) the desirability of saving, for agricultural purposes, the rich and essential fertilizing agents which sewage contains. To the sanitary officer the former is the question of greatest moment, to the agriculturist the latter; while the mass of the population has an equal interest in both. In almost every scheme propounded for dealing with sewage, cognizance is taken of both these points, and thus the problem becomes more difficult of solution.

The composition of sewage as it passes outward, varies greatly, as regards amount and condition of organic matter it contains, and the season of the year — hot or cold — affects very considerably the activity of chemical action. But at all times sewer gases are given off which are fetid and offensive to smell, containing sulphuretted hydrogen, light carburetted hydrogen, free nitrogen, and carbonic acid. The precise influence of such gases on the health, of course, varies with the amount of dilution they undergo before being breathed, and the result of observations under many conditions are rather conflicting. While air contaminated with sewer gases aggravates all diseases, especially those of a febrile nature, there is good ground for believing that choleraic diarrhœa and typhoid fever are directly communicated by emanations from sewers. To prevent such sewer gases from penetrating into houses by means of the drains and pipes, and to keep the sewage from saturating the surrounding soil, and from contaminating any water supply, are objects of prime importance. To accomplish these, the pipes leading from dwellings into main drains and sewers require to be trapped, and the sewers themselves ventilated, drain pipes and tubes made of glazed earthenware or other non-absorbent material must be carefully fitted, and the main sewers made either of pipes of large diameter or of hard bricks bedded in Portland cement. Sewers are properly built in cross section; they should have a uniform gradient, and be as far as possible built free of curves, so that the sewage matter may be carried forward without any tendency to silt or deposit at particular spots. It is also essential that there be ready access to the sewers, as well as to the smaller drains leading into them.

The entrance of sewer gas into houses is provided against by external ventilation of the pipes and by trapping the pipes either by a syphon arrangement, a midfeather, or a flap trap. The syphon, which is used in connection with water closets, consists simply of a deep bend on the exit tube, which bend is at all times filled with water. The midfeather is a modified kind of syphon, consisting of a trough having an inlet and discharge pipe at the same level on opposite sides, but between them a partition passes down into the water with which the trough is always filled up to the level of the two pipes. Such traps are usually put upon sinks. The flap trap consists simply of a hinged valve which opens outward to allow the escape of sewage, etc., but which closes against the resurge of water or the inward pressure of gases. Modified forms of these varieties are numerous; but the general principle of all traps is based on one or other of these forms.

There are two systems by which excremented matter is dealt with for removal: (a) by water carriage, and (b) the dry method. Water-borne sewage is disposed of in the following several ways: (1) Running it into the sea, or into a tidal river, under conditions that will prevent its return, or into open streams. (2) Irrigation. (3) Purification by precipitation. The dry method has now been almost universally abandoned. When the sewage is



SUB IRRIGATION
By means of the asbestine or concrete pipe system of conducting water to the trees and plants in orchard or vineyard.

run into the sea or large body of water its disappearance is due to several causes. It is diluted by the large volume of water into which it is discharged; part of the impurities are deposited by subsidence; part of the organic matter becomes food for aquatic plants and animals; and part of it is destroyed by oxidation and nitrification. As long as the amount of sewage disposed of is insignificant in comparison to the amount of water, this method is not objectionable. But where it interferes with the purity of the water supply this system should be immediately condemned. In many European countries and States of the United States stringent laws have been passed against the indiscriminate use of this system.

Disposal of sewage by irrigation is an efficient method of purification. There are three possible ways, by broad irrigation, intermittent filtration on limited areas, or by sub-surface irrigation. In the first case the ground is first underdrained and the sewage is applied to the surface by means of inclined furrows. In the second method, filter beds of soil are prepared with the specific purpose of filtering the sewage, no attempt being made to raise crops from the deposits. In sub-surface irrigation the sewage is distributed through the soil by drain-tiles laid from 6 to 10 inches below the surface. The sewage passes out at the joints of the tile and is absorbed by the soil. This plan is frequently followed on private grounds, where no sewers are available.

Purification of sewage by precipitation is the third general method. The sewage is collected in tanks and allowed to stand undisturbed till the particles in suspension are deposited at the bottom of the tank when the partly clarified liquid is drawn off. Sieves, filters, and various chemical processes are also used, though the effluent substance which remains is still unfit to be turned into natural water courses.

Sewall, Frank, an American writer and Swedenborgian minister; born in Bath, Me., Sept. 24, 1837; was graduated at Bowdoin College in 1858; studied in the universities of Tübingen and Berlin, Germany, and attended lectures at the Sorbonne; was pastor in Ohio and Glasgow, Scotland; president of Urbana University, O., for 16 years; after 1890 at Washington, D. C. He wrote many denominational and religious works; among them "Moody Mike; or, The Power of Love"; "The Hem of His Garment"; "The Pillow of Stones"; "The New Ethics"; "The New Metaphysics"; "Angelo and Ariel." He was remarkably successful in the translation of Italian and French poetry, and published a translation of the poems of Carducci, and works on him, notably "Giosue Carducci and the Hellenic Reaction in Italy"; "Carducci and the Classic Realism" (1892). His translation of Carducci's sonnet "The Ox" was noticed throughout Europe. He published a translation of the sonnets of J. M. de Heredia (1900).

Sewall, Harriet (Winslow), an American poet; born in Portland, Me., June 30, 1819. She wrote the poem "Why Thus Longing?" Her other poetical compositions were published in a volume of "Poems, With a Memoir" (1889). She died in Wellesley, Mass., in February, 1889.

Sewall, Jonathan Mitchell, an American poet; born in Salem, Mass., 1748. During the Revolutionary War he wrote a ballad, "War and Washington," which was very popular; in his epilogue (1780) to Addison's "Cato" occurs the line "No pent-up Utica contracts your powers"; his "Miscellaneous Poems" were collected and published in 1801. He died in Portsmouth, N. H., March 29, 1808.

Sewall, Samuel, an American jurist; born in Bishopstoke, England, March 28, 1652. He came to America very young, was graduated at Harvard in 1675, and became a member of the council; and as judge of the probate court (1692) took a prominent part in the trials during the Salem witchcraft excitement. He is chiefly remarkable in literary annals for his "Diary" and "Letters," which have been published by the Massachusetts Historical Society (1878–1882). He wrote a tract on the rights of slaves, "The Selling of Joseph" (1711); and published: "The Accomplishment of Prophecies" (1713); "A Memorial Relating to the Kennebec Indians" (1721); and "A Description of the New Heaven" (1727). He died in Boston, Mass., Jan. 1, 1730.

Sewall, Stephen, an American Hebrew scholar; born in York, Me., April 4, 1734. He became librarian and instructor at Harvard College (1762), and Professor of Hebrew (1764–1785). He published a "Hebrew Grammar" (1763); a funeral oration in Latin on Edward Holyoke (1769); "The Scripture Account of the Shechinah" (1794); and left a manuscript "Chaldee and English Dictionary," now preserved in Harvard College Library. He died in Boston, Mass., July 23, 1804.

Seward, Anna, an English poet; born in Eyam, Derbyshire, England, in 1747. Her celebrity as a poet was obtained chiefly from her elegies upon her friend Major André (1781), and upon Captain Cook. She published: "Louisa," a poetical novel (1782), and "Sonnets" (1789). Sir Walter Scott published her "Poetical Works and Correspondence" (3 vols. 1819). She was called "The Swan of Lichfield." She died in Lichfield, March 23, 1809.

Seward, Frederick William, an American lawyer; born in Auburn, N. Y., July 8, 1830; was graduated at Union College in 1849; admitted to the bar in 1851; and for 10 years was one of the editors and owners of the Albany "Evening Journal." He was sent to warn Abraham Lincoln of the plot to assassinate him in Baltimore in 1861; was assistant Secretary of State in 1861–1869 and 1877–1881; accompanied Admiral Porter on the special mission to negotiate West India treaties in 1867; participated in the purchase of Alaska; was a member of the New York Legislature in 1875; State Commissioner at the Yorktown Centennial Celebration in 1881; and author of "Life and Letters of William H. Seward"; "A West Indian Cruise"; and numerous lectures, magazine articles, etc.

Seward, George Frederick, an American diplomatist; born in Florida, N. Y., Nov. 8, 1840; was educated at Union College; was United States consul and consul-general to Shanghai, China, in 1861–1876, and minister to China in 1876–1880. In the latter year he was recalled, having refused to negotiate with the Chinese government for a restriction of Chinese immigration to the United States. During his diplomatic career he was largely instrumental in reducing riots and piracy in China. In 1893 he became president of the Fidelity and Casualty Company of New York. He was the author of "Chinese Immigration in Its Social and Economical Aspects"; etc.

Seward, William Henry, an American statesman; born in Florida, Orange co., N. Y., May 16, 1801. He studied for the bar, and began practising in Auburn in 1823, but gradually drifted into politics, and in 1830 was elected a member of the New York Senate. Displaying marked abilities as a politician he was in 1838 and 1840 chosen governor of his native State, and in 1849 was elected to the United States Senate. He was the friend and adviser of President Taylor, and distinguished himself by his firm resistance to the extension of slavery. In 1860 he was a candidate for the presidency, but being defeated in the convention by Abraham Lincoln he exerted himself to secure Lincoln's election. Lincoln afterward appointed Seward Secretary of State, in which post he discharged his duties with great ability, showing notable tact in dealing with Great Britain in the "Trent Affair" (see TRENT AFFAIR), inducing France to withdraw her troops from Mexico, and effecting the cession to the United States by Russia of Alaska (1867). He was dangerously wounded in April, 1865, when President Lincoln was assassinated, but recovered and filled the same office under Lincoln's successor, Andrew Johnson. He resigned his post on the accession of President Grant in 1869. He wrote a "Life of John Quincy Adams"; his "Speeches, Correspondence, etc." appeared in 1869; and an "Autobiography," with continuation, in 1877. He died in Auburn, Cayuga co., N. Y., Oct. 10, 1872.

Seward, Mount, a mountain in Franklin co., N. Y.; is a summit of the Adirondacks, 14 miles W. of Mount Marcy, and was named for William H. Seward; height, 4,384 feet.

Sewelel, the *Haplondon rufus*, a small rodent from the W. coast of America. It is about a foot long, with a tail of an inch or an inch and a half, brownish above, lighter below. Its habits are approximately those of the PRAIRIE DOG (*q. v.*). It constitutes the genus *Anisonyx* of Rannesque, *Aplodontia* of Richardson, and *Haplodon* or *Haploödon* of later writers. Lilleborg makes it the type of a family *Haploödontidæ*.

Sewell, Elizabeth Missing, an English novelist; born in Newport, Isle of Wight, Feb. 19, 1815; the daughter of a solicitor. She became well known as the authoress of "Amy Herbert" (1844), "Gertrude" (1845), "Lancton Parsonage" (1846), "Margaret Perceval" (1847), and other novels of the so-called High Church school of fiction. She also wrote works of travel, poems, and several elementary historical works. Her brother WILLIAM (1805–1874) was educated at Oxford, became incumbent of Carisbrook and published religious and literary treatises and translations of the classics. She died Aug. 17, 1906.

Sewell, William Joyce, an American statesman; born in Castlebar, Ireland, Dec. 6, 1835; came to the United States in 1851; served with distinction in the Civil War; attaining the rank of Major-General of volunteers; was a member of the New Jersey Senate in 1872–1881; United States Senator in 1881–1887, 1895–1901, and re-elected for the term 1901–1907, and was a delegate to the National Republican conventions of 1876, 1880, 1888, 1892, and 1896. He was a commissioner of the World's Columbian Exposition at Chicago in 1893; for several years commanded the 2d brigade of the National Guard of New Jersey; was vice-president of the West Jersey and Seashore Railroad, a director of the Pennsylvania Railroad, and was also intimately associated with a number of banking and other corporations. At the outbreak of the American-Spanish War he was nominated one of the first Major-Generals of volunteers, but his colleagues believing he could be of more service in the Senate than in the field, he declined the appointment. He died in Camden, N. J., Dec. 27, 1901.

Sewing Machine

Sewing Machine, a machine for sewing or stitching cloth, leather, etc. The various forms of this now well-known and almost universally used machine are all of quite recent introduction. Though really practical and efficient sewing machines are the invention of our own day, many attempts to produce apparatus capable of imitating handsewing and similar effects were made at earlier periods; but none of these was successful except within very narrow limits. The early inventors set themselves chiefly to imitate by mechanical means the ordinary process of hand sewing with all its disadvantages of a limited and ever-varying length of thread. slowness of operation, and a constant friction on the thread. The invention of the double-pointed needle with an eye in the center, in the year 1755, marked a distinct advance toward the invention of the sewing machine, and it was itself used in a form of machine for producing the "shoemaker's stitch." In the eye of the double-pointed needle the sewing thread was fastened, and by a pair of grippers or mechanical fingers the needle was pushed and pulled alternately from the opposite sides of two folds of the material to be sewed. Another form of apparatus which was at one period in use in print and dye works consisted of two fluted rollers between which the edges of cloth to be united were passed, whereby they were so crimped or folded together, that they were easily "spitted" on a long straight needle, held stationary between the wheels, and thus a kind of running or basting stitch of an insecure nature was produced.

In 1830 Barthelemy Thimonnier, a Frenchman, obtained in his native country a patent for a form of sewing machine which was for some time successfully worked, and which was in effect the parent of the single-thread machines now in use. In Thimonnier's apparatus, which was constructed largely of wood, the thread carrier was placed under the table whereon the fabric to be sewed was laid. The needle was in the form of a crochet hook, and having a descending and ascending motion, it passed through the cloth, brought up a loop of thread, which was caught and retained by a nipple till the hooked needle brought up a second loop. The second loop passed through loop No. 1, which thereupon was released and drawn tight, a chain stitch was thus formed, and the cloth being moved forward the length of a stitch, the process was repeated and continued. The apparatus was for some time in considerable use in France, being adapted for embroidering as well as sewing, and when worked without any cloth it formed an ordinary crochet chain or looped cord.

Between 1832 and 1834, Walter Hunt, a New York mechanician, invented and sold several sewing machines which made a practical lock stitch. He, however, neglected to apply for a patent.

The invention of the eye-pointed needle by Newton & Archibald, patented in 1841, and applied by them to the stitching and tamboring of the back of gloves, formed the most important step in the progress of developing the sewing machine, and in no essential principle did their machine differ from the single-thread machines now in use. In 1844 an invention by John Fisher was patented jointly with James Gibbons, in which a shuttle and needle were used for producing a lock stitch, and by a different combination the patent covered the production of what subsequently was known as the Grover & Baker, or knotted stitch. Their machine was specially intended for stitching and ornamenting lace, but it was also described as useful for uniting fabrics. Elias Howe's invention was patented in the United States by himself, and in England by William Thomas in 1846. There is no doubt that Howe, after several years' labor and study, worked out the idea of his sewing machine without any guidance from or knowledge of what had been previously accomplished; and he moreover secured such effective combination of parts as made the Howe machine in reality the acknowledged parent of all the forms since introduced.

Mr. Howe's patience and tenacity of purpose did indeed as much for the success of the sewing machine as his inventive skill. His patent-right for Great Britain was sold for $1,250 to Mr. Thomas, in whose employment Mr. Howe worked for about two years. On returning to the United States in 1849, Howe found that notwithstanding his patent right, several individuals had made, exhibited, and used sewing machines, though not a single machine had yet been made in the United States under his patent. He had, therefore, to face the task of vindicating his rights, and at the same time to introduce to the public his machine. It was not till the end of 1850 that the manufacture of his machine actually began, and it was 1854 before a decision in his favor against J. M. Singer was obtained, in which the judge declared that "for all the benefit conferred upon the public by the introduction of a sewing machine, the public are indebted to Mr. Howe."

The modifications, improvements, and additions made to the sewing machine since its introduction are innumerable. It has now been adapted to produce almost all kinds of stitching which can be done by the hand; and every variety of work required on garments. The leading classes of machines are: (1) Single-thread machines, (2) machines with two or more threads, and (3) overhead or glove-stitch machines.

Single-thread Machines.— The stitch made by the ordinary form of single thread ma-

chine is precisely what is known as the crochet stitch, and when the thread is broken at any point the whole work readily undoes. Ordinary single-thread machines, unless for limited applications, such as glove embroidery, are passing out of general use. It is different, however, with the Wilcox & Gibbs single thread machine, in which a revolving double hook or looper is employed which gives each loop a twist and produces thereby the twisted chain stitch, combining a solid fastening with great elasticity and smoothness. This machine is very simple in construction, light to work, fast and noiseless, and altogether well adapted for family use.

Two-thread Machines.—Of these machines two subdivisions may be recognized — the lock stitch, and the knotted or double chain stitch, commonly called the Grover & Baker machines. Of these, the lock stitch machines are by far the most common, and for general purposes are in almost universal use. For producing the lock stitch there are two forms of apparatus: (1) the reciprocating shuttle which carries a thread through the loop made by the needle, and (2) the lenticular spool or thread case over which the loop is passed by a revolving hook. Of the first kind — shuttle machines — the Howe, the Singer, the Wanzer, and others are familiar forms; the second, or spool and hook appliance, is a peculiarity of the Wheeler & Wilson alone. In the various shuttle machines the driving gear and other details are different, but, as now perfected, the essential combinations and action of the whole are similar. The principal points for consideration are the tension of the upper thread, the motion of the eye-pointed needle, the action of the presser foot and the feed motion, and the driving of the shuttle on the shuttle race, with the adjustment of the tension of the shuttle thread. The upper or needle thread tension is secured in most machines by passing the thread round a circular disk or pulley, to the revolution of which any required amount of friction may be applied by the adjustment of a spring pressing against it. The needle was originally fixed at the end of a vibrating arm, and, describing the arc of a circle, it required to be curved. Singer first introduced the straight needle carried by a slide, and it now is in general use. The presser foot keeps the material firmly pressed against the surface plate by a spring pressure, which can be varied to suit the nature of the work. Next to the invention of the eye-pointed needle the designing of an efficient feed motion was the most important improvement made in the sewing machine. Singer introduced what is called the wheel feed, but the plan now adopted is one of the many ingenious and beautiful mechanical devices introduced by A. B. Wilson, of Wheeler & Wilson. It is called the four-motion feed, and consists of a serrated plate to which a forward, down, backward, and upward motion is communicated, the forward and backward motion being varied according to the length of stitch. The tension of the thread in the shuttle is maintained by a small nipping spring which presses against the thread, Howe's original plan having been to secure friction by passing the thread through several holes in the side of the shuttle. In the Wheeler & Wilson machine the use of the shuttle is entirely avoided, and the lock stitch is formed by carrying the loop from the upper thread over and around the under thread, which is contained within a small lenticular spool, which fits snugly but free in a recess in the side of the revolving hook. This exceedingly ingenious device, together with the four-motion feed above alluded to, place Mr. Wilson, their inventor, in the front rank of improvers of the sewing machine. The Wheeler & Wilson machine as a whole works with great ease and smoothness, and as the machine can be noiselessly worked at a high speed, it is a great favorite for general domestic and light manufacturing uses. The ordinary Grover & Baker machine makes a knotted or double loop chain stitch of a complex character. For general purposes it is not now in great favor, owing to the ridged nature of the seam it makes, and to the considerable waste of thread the peculiar nature of the stitch involves. On the other hand, the machine is rapid and smooth in action, it takes both upper and under thread direct from the spools, and for ornamental purposes its stitch is very useful and effective. Special machines have been devised for working button holes, and by attachments to the ordinary machines button hole stitching can be secured.

Overhand Machines.— In overhand stitching two edges are sewed together by the thread passing over and binding in their outer extremities, a style of sewing generally seen in gloves and invariably used for sacks. In order to effect the sewing of sacks with this stitch by machinery, many attempts have been made, and some of them have attained a degree of practical success. In Laing's overhand machine, invented and manufactured in Dundee, a helical needle is employed, which in its motion of rotation passes from end to end to the sack seam, drawing the thread through with it.

Sewrin, Charles A. (sā-ē-ra*ng′*), a French dramatist; born in Metz, Alsace-Lorraine, in 1771. He wrote among others: — Comic operas: "The Village School"; "The Opera in a Village"; "Of Old and Now-a-Days"; "The Blacksmith of Bassora"; "The Young Mother-in-Law." Come-

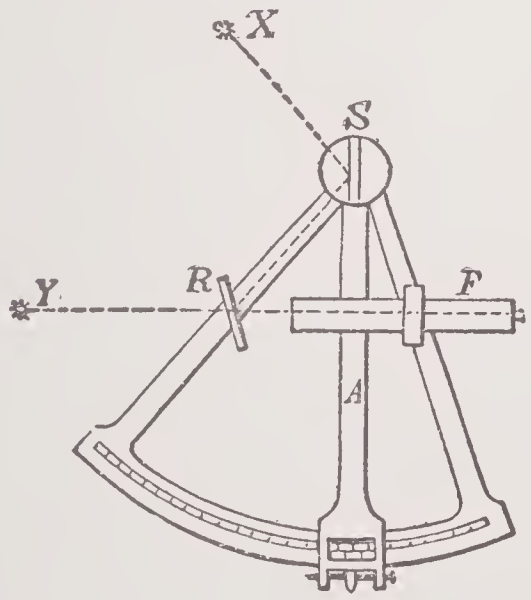
dies: "My Uncle Antony"; "The Country Cits"; "Gulliver"; "The Swiss Milkmaid." Novels: "The Story of a Dog" (1801); "Story of a Cat" (1802); "A Family of Liars" (1802); "The Friends of Henri IV." (1805). He died in Paris in 1853.

Sexagesimal Fraction, a fraction whose denominator is some power of 60, as $\frac{1}{60}$, $\frac{1}{3600}$, $\frac{1}{216000}$. Such fractions were alone used in astronomical calculations, and so were formerly also called astronomical fractions. They are still retained in the division of the circle and of time, each degree or hour being divided into 60 minutes, and each minute into 60 seconds, and so on.

Sexagesima Sunday, the second Sunday before Lent, the one immediately before Shrove Tuesday, so called because it falls about 60 days before Easter.

Sextans ("the Sextant"), one of the 10 new constellations added to the heavens by Hevelius in his "Prodomus Astronomiæ" (Forerunner of Astronomy), in 1690, of which eight have survived to the present day. It is surrounded by Leo, Crater, and Hydra. Not having been known as a constellation in Bayer's time, it has gone without Greek letters attached to its stars till recently, when Gould assigned them to five of its brightest stars. It is a very inconspicuous constellation, the brightest star being only of the 4.9 magnitude.

Sextant, an instrument for measuring the angular distance of objects by means of reflection. The principle of its construction depends on the theorem that if a ray



SEXTANT.

of light suffer double reflection the angle between the original ray and its direction after the second reflection is double the angle made by the reflecting surfaces. The instrument of which this theorem is the principle is a brass sector of a circle in outline, the sector being the sixth part of a complete circle, for which reason the instrument is called a sextant. It consists of a graduated limb, forming about the sixth part of a circle. Two mirrors, R, S, adjusted to it perpendicularly to its surface, have for object to reflect the rays of light coming from the object, X, under observation. A telescope, F, collects and transmits to the eye the rays of light emanating from the mirror R, showing the image as at Y. An index and a vernier, A, permit the reading, on the gradnated limb, of the quantity of light which the mirror has turned. When observing altitudes, the instrument is held perpendicularly to the horizon in the plane of the line joining the two objects. In taking noon observations at sea, to determine the latitude, the observer takes his place shortly before meridian, and turning down one or several of the shades, to prevent his eye being injured by the glare, directs the telescope or site tube to the sun, moving the index so as to bring its reflected image to coincide with the sea horizon; as the sun rises, he gradually advances the limb, clamping it and using the regulating screw for this purpose, as the sun's path becomes more nearly horizontal, and slightly rocking the instrument from side to side to insure that it is in a vertical plane at the moment when the sun attains his greatest height. The reading of the limb at the moment when the sun begins to dip is noted, and a very simple calculation, adding his declination derived from the "Nautical Almanac" to the true zenith distance obtained by observation, gives the latitude.

Sexton, an under officer of the church, whose duty is to take care of the vessels, vestments, etc., belonging to the church, to attend on the officiating minister, and perform other duties pertaining to the church, to which is, in England, added the duty of digging and filling up graves in the churchyard.

Sextus Empiricus, a celebrated sceptic, who flourished in the first half of the 3d century A. D. He was probably a Greek by birth, and he is said to have lived at Alexandria and Athens. Scepticism appears in his writings in the most perfect state which it had reached in ancient times, and its object and method are more clearly developed than they had been by his predecessors (see SCEPTICISM). There are extant two works by him, written in Greek, one, entitled "Outlines of Pyrrhonism," explains the method of Pyrrho; the other, entitled "Against the Mathematicians," is an attempt to apply that method to all the prevailing philosophical systems and other branches of knowledge.

Sexual Selection, a term applied by Darwin to the process of favoring and eliminating which to some extent occurs in the mating of many animals. It is a special

Sexual Selection

case of natural selection, depending on a competition between rival males, in which a premium is set on those qualities which favor their possessors in securing mates. This competition takes two forms: On the one hand, rival mates, for instance stags and gamecocks, fight with one another, and the conquerors have naturally the preference in mating; on the other hand, rival males sometimes seem to vie with one another in displaying their attractive qualities before their desired mates, who, according to Darwin, choose those that please them best. Darwin gives the following summary of his theory:

"It has been shown that the largest number of vigorous offspring will be reared from the pairing of the strongest and best-formed males, victorious in contests over other males, with the most vigorous and best-nourished females, which are the first to breed in the spring. If such females select the more attractive and, at the same time, vigorous males, they will rear a larger number of offspring than the retarded females, which must pair with the less vigorous and less attractive males. So it will be if the more vigorous males select the more attractive and, at the same time, healthy and vigorous females; and this will especially hold good if the male defends the female, and aids in providing food for the young. The advantage thus gained by the more vigorous pairs in rearing a larger number of offspring has apparently sufficed to render sexual selection efficient."

Where there is direct competition between males, the weakest will tend to be eliminated, either directly by death or injury in the struggle, or indirectly by diminished success in reproduction. In the same way, if a male be lacking in the qualities necessary to find a mate — *c. g.*, in senses acute enough to find out her whereabouts — that male may remain unreproductive. But there is not enough of evidence to enable us to compute how many males do remain unmated in consequence of non-success in competition.

In regard to the second aspect of sexual selection, in which the females are believed to exercise some choice, giving the preference to those suitors which have brighter colors, more graceful forms, sweeter voices, or greater charms of some kind, there is no little difference of opinion. Darwin indeed believed strongly in the female's choice, and referred to this process of selection many of the qualities which distinguish male animals. The females "have by a long selection of the more attractive males added to their beauty or other attractive qualities." "If any man can in a short time give elegant carriage and beauty to his bantams, according to his standard of beauty, I can see no reason to doubt that female birds, by selecting during thousands of generations the most melodious or beautiful males, according to their standard of beauty, might produce a marked effect." On the other hand, Alfred Russel Wallace maintains a very different position. "There is," he says, "a total absence of any evidence that the females admire or even notice the display of the males. Among butterflies there is literally not one particle of evidence that the female is influenced by color or even that she has any power of choice, while there is much direct evidence to the contrary." Against this, G. W. and E. G. Peckham, in their careful essay on sexual selection in spiders, state that they have in the Attidæ "conclusive evidence that the females pay close attention to the love dances of the males, and also that they have not only the power, but the will, to exercise a choice among the suitors for their favor." Some observers of birds are also confident that the females choose the more musical or otherwise attractive males. But again Wallace maintains that the fact that every male bird finds a mate "would almost or quite neutralize any effect of sexual selection of color or ornament; since the less highly colored birds would be at no disadvantage as regards leaving healthy offspring." In spiders, however, it seems that the more brilliant males may be selected again and again while the mating season lasts.

The theory of sexual selection is of considerable importance in a general theory of evolution. This may be illustrated in reference to the bright plumage of many birds. If we postulate successive crops of variations (which cannot at present be completely rationalized), if we acknowledge that there is really "preferential mating" among birds (which is not readily proved or disproved), if we believe that the females are sensitive to the slight excellences which distinguished one suitor from another and that their choice of mates is determined by these excellences (which Wallace emphatically denies), then we may say that the greater brightness of male birds may have been evolved by sexual selection. This was Darwin's opinion. The brighter males succeeded better than their rivals in the art of courtship; the variations which gave them success were transmitted to the offspring; gradually the qualities were established and enhanced as secondary sexual characters of the species. But Wallace interpreted the facts quite otherwise. The relatively plain plumage of the female birds was due to natural selection, eliminating those whose conspicuousness during incubation was fatal, fostering those whose coloring was protective. Just as Daines Barrington, a naturalist, still remembered as the correspondent of Gilbert White, suggested (1773) that singing birds were small and hen birds mute for safety's sake, so Wallace maintained that female birds had forfeited brightness as a ransom for life.

But, leaving the birds, let us take a case which seems to afford better illustration of Darwin's theory of sexual selection — that of spiders. The courtship of these

animals has been observed and described by G. W. and E. G. Peckham in a manner so careful that their paper ranks as one of the most important contributions yet made to the theory of sexual selection. "The fact that in the Attidæ the males vie with each other in making an elaborate display, not only of their grace and agility, but also of their beauty, before the females, and that the females, after attentively watching the dances and tournaments which have been executed for their gratification, select for their mates the males that they find most pleasing, points strongly to the conclusion that the great differences in color and in ornament between the males and females of these spiders are the result of sexual selection." It may be that the American observers have, especially in their psychological language, mingled a little imagination with their induction, but they state a strong case for sexual selection.

The conclusions drawn from the courtship of spiders are not affected by Wallace's criticism so seriously as are those which Darwin drew from the courtship of birds, and this suggests that the wisest position is one of compromise, which recognizes that in some cases — *e. g.*, spiders — the external divergence of the sexes may depend on sexual selection, and that in other cases — *e. g.*, birds — it may depend rather on natural selection.

But even with this compromise it is difficult to rest satisfied. For before we can believe that attractively bright ornaments could become characteristic of males by sexual selection, or that protectively plain coloring could become characteristic of females by natural selection, we must assume that the qualities of brightness can be entailed in inheritance on the males only, and the qualities of plainness on the females only. But this fundamental assumption has not yet been justified by a sufficiently strong body of facts.

This difficulty arouses skepticism as to the thoroughness of the explanations of secondary sexual characters suggested either by Darwin or by Wallace. We are not surprised, therefore, to find Mivart's explanation of the beauty of males as the direct expression of an internal force, or Mantegazza's hints as to physiological explanation of the sexual divergence, or Brook's reference to "something within the animal which determines that the male should lead and the female follow in the evolution of new breeds." Geddes advanced further, endeavoring to interpret the secondary sexual characters as outcrops of the relative preponderance of anabolism and katabolism characteristic of females and males respectively. Gay coloring — sometimes at least due to pigmented waste products — is regarded as a characteristic expression of the predominantly katabolic or male sex, and quiet plainness is equally natural to the more anabolic females. But this theory, which seeks to rationalize the variations which Darwin simply postulated, is by no means inconsistent with a recognition of sexual selection as an accelerant directive process in the evolution of male brightness, or of natural selection as a retardative directive process eliminating disadvantageously conspicuous females.

Wallace has also in his work on "Darwinism" (1889) worked toward a rational interpretation of the variations which he was previously content to postulate as facts. For he says that "ornament is the natural outcome and direct product of superabundant health and vigor," and is "due to the general laws of growth and development." It seems to some that this mode of interpreting characters is of far-reaching importance, and that it affects not only the theory of sexual selection but that of natural selection as well.

The Peckhams do indeed deny that male spiders possess greater vital activity than the females, and they find no relation in either sex between activity and development of color. But it must be noted that a predominant katabolic diathesis — which is, according to Geddes, the fundamental characteristic of maleness — may be true of male spiders though not expressed in greater vital activity.

We must of course be careful to distinguish that the suggestions made by Geddes, Wallace, and others as to the physiological meaning of sexual characters have to do with primary factors in evolution — *i. e.*, with those which originate variations — while the explanation of the differences in plumage between male and female birds, either by the theory of sexual selection (according to Darwin), or by natural selection (according to Wallace), have to do with secondary factors in evolution — *i. e.*, with those which foster or eliminate variations. Apart from the problem of the origin of the sexual variations the central question with regard to sexual selection by preferential mating is, as Lloyd Morgan says, what guides the variation along special lines leading to heightened beauty. "Sexual selection by preferential mating involves a standard of taste; that standard has advanced from what we consider a lower to what we consider a higher æsthetic level, not along one line but along many lines. What has guided it along these lines?"

To sum up, the problems involved in sexual selection are (1) what physiological conditions explain the secondary sexual characters which so often distinguish males and females; (2) to what extent and in what degree of refinement does preferential mating occur; and (3) to what extent has sexual selection guided the differentiation of the sexes alike in distinctive qualities

and in æsthetic sensitiveness? Before these problems can be adequately solved many more facts must be accumulated.

Seybertite, an orthorhombic mineral occurring mostly in tabular crystals with a thin foliated micaceous structure; hardness, 4-5; sp. gr., 3-3.1; luster, pearly; color, reddish-brown, yellowish, copper-red. Composition: A hydrated silicate of alumina, magnesia, lime, with some sesquioxide and protoxide of iron. Dana divides this species into (1) the Amity seybertite, (2) xanthophyllite, and (3) brandisite.

Seychelles (sā-shel′), a group of about 30 islands in the Indian Ocean; between lat. 3° 40′ and 5° 35′ S., and lon. 55° 15′ and 56° E. They were first occupied by the French, and were ceded to the British in 1814. The settlers are mostly of French extraction. The largest island is Mahé, the majority of the others being mere rocks. With the exception of two consisting of coral, they are composed of granite piled up in huge masses, and terminating in peaks. Most of them are covered with verdure, and yield good timber. Cotton, coffee, cocoa, spices, tobacco, maize, rice, and tropical fruits are cultivated; and cocoanut oil, soap, vanilla, etc., exported. Pop. (1901) 19,237.

Seychelles Cocoanut, the *Lodoicia Seychellarum,* a remarkable palm found only on two or three small rocky islands of the Seychelles group. The fruit takes several years to come to maturity, when it attains a gigantic size, weighing often 40 to 50 pounds, and consists of a thick fibrous rind enclosing one or more nuts divided half-way down into two lobes. The unripe fruit is eaten, and the hard black shell of the nut is carved into ornaments and fakirs' drinking cups. The leaves when young yield a beautiful material for basket and plaited work; hats, fans, etc., are made from them; when full grown they are used for partitions and roofs of houses. See PALMS.

Seymour, an historic family, originally settled in Normandy at St. Maur — whence the name. Going over to England, they obtained lands in Monmouthshire as early as the 13th century, and in the 14th at Hatch Beauchamp, Somersetshire, by marriage with an heiress of the Beauchamps. In 1497 SIR JOHN SEYMOUR helped to suppress the insurrection of Lord Audley and the Cornish rebels, and subsequently he accompanied Henry VIII. to his wars in France, and to the Field of the Cloth of Gold. For his daughter, see SEYMOUR, LADY JANE; his second son, THOMAS, created Lord Seymour of Sudeley, became Lord High Admiral of England and the second husband of Henry's widow (Catharine Parr), but ended his life on the scaffold (1549). Sir John's eldest son, EDWARD, was successively created Viscount Beauchamp, Earl of Hertford, and Duke of Somerset, and as Protector played the leading part in the first half of the reign of EDWARD VI. (*q. v.*). The Protector's eldest son by his second marriage, being created by Elizabeth Earl of Hertford, married the Lady Catharine Grey, a grand-niece of Henry VIII., and sister of the unfortunate Lady Jane Grey — a marriage which entailed on him a nine years' imprisonment and a fine of $75,000. His grandson, who in 1621 succeeded him in the earldom of Hertford, also fell into disgrace for attempting to marry the Lady Arabella Stuart, cousin of James I., but subsequently, playing a conspicuous part in the royalist cause in the Great Rebellion, obtained a reversal of the Protector's attainder, and in 1660 took his seat in the House of Peers as 3d Duke of Somerset, though the descendants of the first duke by his first marriage, were then in existence. He died unmarried in 1671, and the ducal title ultimately passed to a cousin, on whose death it was inherited by CHARLES SEYMOUR (1661–1748), known in history as the "Proud Duke of Somerset," a nobleman whose style of living was ostentatious and haughty in the extreme, and who filled several high posts in the courts of Charles II., William III., and Anne. He married the heiress of the Percies, by whom he had a son, ALGERNON, 7th duke, who in 1749 was created Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, the ancestor of the present Percy line. On the death of this duke in 1750 a curious peerage case arose, the title being claimed by the descendants of the 1st duke by his first marriage; and the attorney-general having reported in favor of the claim, SIR EDWARD SEYMOUR took his seat in the House of Peers as 8th duke. The earldom of Hertford, which became extinct in 1750, was in that same year conferred on this 8th duke's first cousin, FRANCIS, who in 1793 was advanced to the dignity of marquis, and one of whose great-grandsons was created Baron Alcester. See SEYMOUR, FREDERICK BEAUCHAMP PAGET.

Seymour, Frederick Beauchamp Paget, 1st Baron Alcester, an English naval officer; born April 12, 1821; entered the naval service in 1834; was promoted captain in 1854; became rear-admiral in 1870; and vice-admiral in 1876. He was chief in command of the allied fleet against the Turks, off the Albanian coast, in 1880, and forced the enemy to agree to a cession of Dulcigno to Montenegro; promoted admiral in 1882; commanded the English fleet that bombarded Alexandria in July, 1882; and was raised to the peerage July 24 of that year. He died March 30, 1895.

Seymour, George Franklin, an American clergyman; born in New York city,

Jan. 5, 1829; was graduated at Columbia College in 1850 and at the General Theological Seminary in 1854; was ordained in the Protestant Episcopal Church in 1855; held various charges till 1865, when he was made Professor of Ecclesiastical History at the General Theological Seminary. He was also dean in 1875–1879. He was consecrated first Protestant Episcopal Bishop of Springfield in June, 1878. His publications include: "Some Considerations Why the Name of the Protestant Episcopal Church Should be Changed" (1888); "What is Modern Romanism?" (1885); "Amusements in their Relation to Religion" (1890); "Marriage and Divorce" (1893); "The Church Idea of the Family" (1899); etc. He died Dec. 8, 1906.

Seymour, Horatio, an American statesman; born in Pompey Hill, Onondaga co., N. Y., May 31, 1810. After serving three terms, with marked ability, in the New York Legislature, in 1852 he was elected governor on the Democratic ticket. At the outbreak of the Civil War he was decidedly in favor of the supremacy of the Constitution, and as governor a second time (1863-1865) showed conspicuous energy and ability in raising troops. His second incumbency of the governorship was marked by the draft riots in 1863. In 1868 he was defeated for the presidency by General Grant. As an orator, Mr. Seymour was easy, agreeable, and powerful, rising often into true eloquence. He died in Utica, N. Y., Feb. 12, 1886.

Seymour, Lady Jane, the third wife of Henry VIII., and the mother of Edward VI.; born in England, about 1510. She was at first maid of honor to Anne Boleyn, whom she supplanted in 1536. She died Oct. 24, 1537, a few days after giving birth to her son.

Seymour, Mary Harrison, an American story-writer; born in Oxford, Conn., Sept. 7, 1835. She published: "Mollie's Christmas Stocking" (1865); "Sunshine and Starlight" (1868); "Posy Vinton's Picnic" (1869); "Ned, Nellie, and Amy" (1870); "Recompense" (1877); "Every Day" (1877); and "Through the Darkness" (1884).

Seymour, Thomas Day, an American educator; born in Hudson, O., April 1, 1848; was graduated at Western Reserve College in 1870; and was made Professor of Greek at Yale University in 1880. His publications include editions of "Selected Odes of Pindar, with Notes" (1882); "Introduction to the Language and Verse of Homer" (1885); "Homer's Iliad" (books I. to VI., "College Series," 1887–1890); "Introduction and Vocabulary to School Odyssey" (8 books, 1897); "Homeric Vocabulary"; etc. He died Dec. 31, 1907.

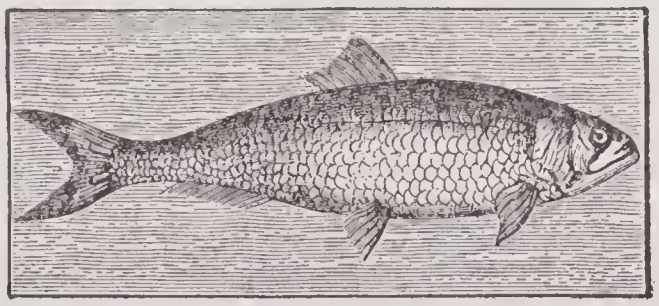
Seymour, Thomas Hart, an American lawyer; born in Hartford, Conn., in 1808; received an academic education and was admitted to the bar about 1833; was a member of Congress in 1843–1845; then refused a renomination; entered the army at the beginning of the Mexican War as major of the 9th Regiment of New England Volunteers. On Oct. 13, 1847, when Colonel Ransome, the commander of the regiment, fell in the attack on Chapultepec, he took charge of the command, and was the first to enter the fortress. He was then made commander of the regiment and participated in the capture of Mexico City. He was elected governor of Connecticut in 1850, 1851, 1852, and 1853; and was minister to Russia in 1853–1857. He died in Hartford, Conn., Sept. 3, 1868.

Sfax, a town on the E. coast of Tunis, situated in the midst of fruit gardens. It is surrounded by walls and bastions, and has a strong citadel. It exports large quantities of fruit, wool, sponges, alfa, etc. Sfax was captured by the French after a two days' bombardment on July 16, 1881. Pop. about 30,000.

Sgraffito, or **Scratched Work,** the name given to a mode of external wall decoration practised in Italy, and of which examples have been found in Pozzuoli near Naples, of the date of about 200 B. C. The process is accomplished by means of superimposed layers of plaster applied and operated on in the following manner: First, the wall having been thoroughly moistened to ensure adhesion, a ¾-inch coat of plaster is floated on, and before it is perfectly dry a ¼-inch skin of black, red, or any other colored plaster that will not fade is applied; when this is set and while it is still wet, a finishing coat of white plaster is added. A full-sized drawing of the design that is to be realized is then transferred to this outer coating, and the outline cut through to the second coat with a sharp instrument, and made broad or narrow according to the effect desired, and where necessary these incisions are enforced by additional lines as shading. The process is an economical mode of obtaining effect, but like "fresco" requires to be executed while the material is moist, and therefore no more should be prepared than can be immediately operated on. Examples of the system are to be found in the choir boys' school of St. Paul's Cathedral, the inner court of the Science Schools at South Kensington, some private residences, and the interiors of some churches in England. The application of this principle of decoration is not confined to plaster, but extends also to superimposed metals and to pottery. There are 15th-century specimens of sgraffito pottery in the South Kensington Museum. The examples of house decoration in Italy are of the 15th, 16th, and 17th centuries.

Shabbathai Zewi, a Jew; born in Smyrna, in 1641; was a convert to the fantasies of Isaac Luria, a great student of the Cabbala, who declared that he held intercourse with the prophet Elijah, and that he was the Messiah, the son of Joseph. The notion of two Messiahs occurs in the Talmud: a "son of David," and a "son of Joseph," the latter being the forerunner of the former, and destined to suffer death in the struggle with the enemies of the kingdom of God. Shabbathai Zewi himself came forward first as a prophet, and then gave himself out for the Messiah, and, notwithstanding that he was repudiated by the rabbis, gained a large number of followers among his coreligionists. Though he was converted to Mohammedanism (1667), the sect survived, and still acknowledge him as the Messiah. This they were enabled to do by justifying his apostasy, which they did on the ground that "the form of religion which he proclaimed stood as far above Judaism as it did above Christianity and Mohammedanism, was destined to absorb all the three, and consequently was indifferent to each one's particular usages." One of the principal tenets of the sect was that the Talmud was full of errors and promoted immorality. From the great veneration they paid to the Cabbala, and especially the book Zohar, they received the name of Cabbalists or Zoharites. They acknowledged a Trinity in the Godhead, regarding Adam as an incarnation of the divine nature and the second Person, and their Messiah as the third. There are said to be some remnants of the sect still lingering in Poland and Turkey.

Shad, the popular name of three anadromous fishes of the genus *Clupea:* (1) The allice or European shad. (2) The American



COMMON SHAD.

shad, *C. sapidissima,* an important food fish, abundant on the Atlantic coast of America, and in some of the American rivers. It spawns in fresh water. Great quantities are salted. (3) The Twaite shad, *C. finta,* from 12 to 16 inches long, with 21–27 stout osseous gill-rakers on the horizontal part of the outer branchial arch. Common on the coasts of Europe, ascending rivers; abundant in the Nile. The flesh is coarser than that of the allice shad.

Shaddock (*Citrus decumana*), sometimes called pompelmoose, a large species of orange, attaining the diameter of seven or eight inches, with a white, thick, spongy, and bitter rind, and a red or white pulp of a sweet taste, mingled with acidity. It is a native of China and Japan, and was brought to the West Indies by a Captain Shaddock, from whom it derived its name.

Shadoof, a machine employed to irrigate the land during the time of low water in the Nile river. This machine is the oldest with which the race is historically acquainted, and it is maintained that in no machine invented in modern times is the result so great in proportion to the degree of power employed. The best and briefest description represents it as consisting of two posts, about five feet in height and three feet apart, connected at the top by a horizontal bar; across this is the branch of a tree, having at one end a weight, composed of mud, and, at the other, suspended to it by two palm sticks, a bucket made of basket work or matting, or of a hoop with woolen stuff or leather. This is worked by one man. Goat skin buckets are often used. The man who works it stands on the edge of the river; before him is a hole full of water fed from the stream. When he works it he takes hold of the cord by which the empty bucket is suspended, and, bending down, by the weight of his shoulders dips it in the water; he then rises with his hands still on the cord; this gives the bucketful of water an upward movement, and the weight strung on the other end of the pole gets into action, which lifts it over to a trough, into which, as it tilts over, it empties the water. One man works this machine and lifts up water with it from 6 to 8 feet. The men who work these keep on all day, bowing and rising, and do the work in a very graceful manner. Their feet are in the water and their heads in the sun. They wear very little clothing — a flesh-colored cloth around the loins and a tight-fitting skull cap. As the river sinks it is necessary to have a series of shadoofs, two or three, and sometimes five, one above the other. In this case the one nearest the river throws the water up into the hole; the second takes it from that to a second rude reservoir; the third into still another; and so on, till the last, which pours it into the trough. The spectacle presented of these five rows on the river bank, as viewed from the deck of the dahabeah or the lower deck of a steamer, is fascinating. Some of them have two levers worked by two men. See IRRIGATION.

Shadow. (1) Shade within defined limits; the figure of a body projected on the ground, etc., by the interception of light; obscurity or deprivation of light, apparent on a surface or plane, and representing the

form of the body which intercepts the rays of light. (2) Darkness, gloom, shade, obscurity. (3) The dark part of a picture; the representation of comparative deficiency or deprivation of light; shade. (4) A reflected image, as in a mirror or water, hence, any image or portrait.

Figuratively: (1) An imperfect or faint representation; an adumbration, a prefiguration; a dim foreshadowing or bodying forth. (2) A type, a mystical representation. (3) A slight or faint appearance; a shade. "With whom is no variableness, neither shadow of turning."—James i: 17. (4) Something unsubstantial or unreal, though presenting the appearance of reality; an image produced by the imagination. (5) A constant or inseparable companion or attendant. (6) An uninvited guest, introduced to a feast by one who is invited (a translation of the Latin *umbra*). (7) shelter, protection.

In optics, shadows are, theoretically considered, of two kinds, geometrical and physical. If a shadow be supposed to be produced by the interception of light proceeding from a single mathematical point, it will be well defined by straight lines proceeding from the point, and grazing the intervening object. But as every luminous body is possessed of some magnitude, and, therefore, emits light from many points, the shadow is not precisely defined, but consists of a portion in perfect shadow, or to which no luminous rays have access, and penumbra, to which some rays have access. In the former case the theoretical shadow is a geometric one, in the latter physical, *i. e.*, such as actually occurs in nature.

May your shadow never be (or grow) less, an expression meaning may you escape the clutches of the devil! hence, may you be fortunate. It was fabled that when students of magic had attained a certain proficiency, they had to run around a subterranean hall, pursued by the devil. If he succeeded in catching only their shadow, they became first-rate magicians, but were thenceforth shadowless.

Shadowgraph. The same as RADIOGRAPH (*q. v.*).

Shadwell, Thomas, an English dramatist; born in Stanton Hall, Norfolk, England, about 1640. His comedy "The Sullen Lovers," produced in 1668, brought him reputation. Among many other plays, he was the author of "The Virtuoso" 1676); "Lancashire Witches" (1682); "The Squire of Alsatia" (1688); and "Volunteers; or, The Stock-Jobbers" (1693). He became poet-laureate and historiographer royal in 1688, succeeding Dryden in both positions. ("Works," 4 vols. 1720.) He died Nov 20, 1692.

Shaffer, Newton Melman, an American physician; born in Kinderhook, N. Y., Feb. 14, 1846; was graduated at the Medical College of New York University in 1867; was assistant surgeon of the New York Orthopædic Dispensary and Hospital in 1871–1875, and surgeon-in-chief in 1876–1898. In the latter year he became Professor of Orthopædic Surgery at the Medical College of Cornell University. He designed numerous apparatus for deformities, particularly for hip, spine, and clubfeet. His publications include: "Pott's Disease: Its Pathology and Mechanical Treatment" (1879); "The Hysterical Element in Orthopædic Surgery" (1898); etc.

Shaffner, Taliaferro Preston, an American inventor; born in Smithfield, Va., in 1818; studied law and was admitted to the bar, but gave much of his time to invention. He was an associate of Prof. S. F. B. Morse in the introduction of the telegraph; built the line from Louisville, Ky., to New Orleans, and that from St. Louis to Jefferson City in 1851; was a projector of a North Atlantic cable; the inventor of several methods of blasting; and held office in various telegraph companies. He engaged in the Dano-Prussian War in 1861; was a member of various scientific societies of Europe, and published several treatises on the telegraph. He died in Troy, N. Y., Dec. 11, 1881.

Shafter, William Rufus, an American military officer; born in Galesburg, Mich., Oct. 16, 1835; at the outbreak of the Civil

GEN. WILLIAM R. SHAFTER.

War he entered the 7th Michigan Infantry as a 1st lieutenant, Aug. 22, 1861; engaged in the battles of Fair Oaks, Savage Station, Glendale, and Malvern Hill; became major of the 19th Michigan Infantry, Sept. 5, 1862; was in the action at Thompson Station, Tenn. (taken prisoner in March, 1863, and exchanged in May, 1863); became lieutenant-colonel of the 19th Michigan In-

Shaftesbury

fantry, June 5, 1863; colonel of the 17th United States colored troops, April 19, 1864; brevet Brigadier-General of volunteers for gallant and meritorious services during the war; and was mustered out of the volunteer service Nov. 2, 1865. He entered the regular army and became lieutenant-colonel of the 41st Infantry, Jan. 26, 1867; assigned to the 24th Infantry, April 14, 1869; colonel of 1st Infantry, March 4, 1879; and Brigadier-General May 3, 1897. On the breaking out of the American-Spanish War he was given command of the army mobilized for the invasion of Cuba; his first decisive move was the landing of 16,000 men in Cuba in about 12 hours without an accident. For details of this campaign see SANTIAGO MILITARY CAMPAIGN. After the war he commanded the Departments of California and Columbia; was retired in 1901; died Nov. 12, 1906.

Shaftesbury, Anthony Ashley Cooper, 1st Earl of, an English statesman; born in Wimborne, St. Giles, Dorsetshire, England,

LORD SHAFTESBURY.

July 22, 1621. He succeeded to a baronetcy on the death of his father in 1631. After leaving Exeter College, Oxford, he studied law at Lincoln's Inn, and was chosen representative for Tewkesbury in 1640. At the commencement of the civil war he supported the royal cause, but advised mutual concession. Finding that in consequence of this opinion he was distrusted by the court he joined the Parliament, and received command of its forces in Dorsetshire. When Cromwell turned out the Long Parliament, Sir Anthony was one of the members of the convention which succeeded, nevertheless he signed the protestation charging the protector with arbitrary government, which did not, however, prevent him from becoming one of his privy-council. After the deposition of Richard Cromwell he aided the restoration of Charles II. with all his influence, and in 1661 was created Baron Ashley, and appointed chancellor of the exchequer and a lord of the treasury. Yet he strongly opposed the Corporation Act (1661) and the Act of Uniformity (1662), both measures favored by the crown. He afterward became a member of the obnoxious cabal. In 1672 he was created Earl of Shaftesbury and lord high chancellor. His conduct on the bench was able and impartial, but he was deprived of office, probably through the influence of the Duke of York; and he at once became one of the most powerful leaders of the opposition. For his warmth in asserting that a prorogation of 15 months amounted to a dissolution of Parliament he was confined in the Tower from February, 1677, to February, 1678. After his liberation he took a prominent part in the attacks on Catholics during the popish-plot scare. In 1679 he became president of the council and the same year was instrumental in passing the Habeas Corpus Act. In 1681 he was indicted for high treason but acquitted. He entered into the plots of the Monmouth party and had to fly to Holland, where he died in Amsterdam, Jan. 21, 1683. He is the Achitophel of Dryden's famous satire.

Shaftesbury, Anthony Ashley Cooper, 3d Earl of, an English philosophical and moral writer, grandson of the preceding; born in Exeter House, London, England, Feb. 26, 1671. When only 11 years of age he could read Greek and Latin with ease. In 1693 he became the representative in Parliament of Poole, in Dorsetshire, and strongly supported measures favorable to public liberty. In consequence of ill health he resigned his seat in 1698, and visited Holland as a student of physic, where he became acquainted with Bayle, Leclerc, and other literary men. In 1708–1709 he published several works of a philosophical character, among others a "Letter on Enthusiasm" and an "Inquiry concerning Virtue or Merit." In 1710 his rapidly declining health led him to fix his residence at Naples. His writings were collected and published together under the title of "Characteristics of Men, Manners, Opinions, and Times." In 1716 and 1721 collections of his correspondence were published. As a writer he is remarkable for the elegance but also for the excessive artificiality of his style. In all his works Lord Shaftesbury was a firm believer in the fundamental doctrines of natural religion; but, though he professed a respect for Christianity, he was doubtless sceptical in regard to revelation, and sometimes indulged his humor on Scriptural points. He died in Naples, Italy, Feb. 15, 1713.

Shaftesbury, Anthony Ashley Cooper, 7th Earl of, an English philanthropist, son

of the 6th earl; born in London, England, April 28, 1801. He was educated at Oxford, and sat in the House of Commons from 1826 to 1851, when he succeeded to the peerage. He supported the administrations of Liverpool and Canning, and zealously labored to improve the condition of the laboring classes. He was president of the Bible Society, of the Pastoral Aid Society, of the Protestant Alliance, and of other religious organizations. He died in Folkestone, England, Oct. 1, 1885.

Shag, coarse hair or nap; rough woolly hair; a kind of cloth having a long coarse nap; a kind of tobacco cut into fine shreds; a shred; roughness, coarseness; in ornithology, the *Phalacrocorax graculus*, the scart, or crested cormorant. It is smaller than the common cormorant (*P. carbo*), from which it is distinguished also by its rich dark green plumage, with purple and bronze reflections. Total length, 27 inches; both sexes colored alike. They pair early in April, and as many as five eggs have been frequently found.

Shagreen, a species of leather, or rather parchment, prepared without tanning, from the skins of horses, asses, and camels. The strips, having been softened by steeping in water, and cleared of the hair, are spread on the floor and covered with the seeds of the goose-foot (*Chenopodium album*). A covering of felt is laid on, and the seeds are pressed into the skin by trampling or mechanical means, thus producing the peculiar granular appearance of shagreen. It is dyed green with sal-ammoniac and copper filings, red with cochineal, etc. Shagreen is also made of the skins of otters, seals, sharks, etc. It was formerly much used for cases for spectacles, instruments, watches, etc.

Shah, the title given by European writers to the sovereign of Persia; in his own country he is known by the compound title Padishah. Also a chieftain or prince.

Shahabad, a town of Oude, India; 80 miles N. W. of Lucknow, with a pop. of about 18,510 — only a third of what it was in the 16th century. In 1868 there was a savage riot here between Hindus and Mussulmans at the Moharram festival.

Shah Alum ("king of the universe"), the last of the Mogul emperors of Delhi who exercised even a nominal independence, reigned from 1759 to 1806. For 12 years he was an exile, chiefly at Allahabad, where on Aug. 12, 1765, he granted to the East India Company the Dewanny of Bengal, Behar, and Orissa. In 1771 he put himself under the power of the Mahrattas, but in 1788 a Mohammedan rebel, Ghulam Kadir, seized Delhi and with his own dagger struck out the emperor's eyes. The Mahratta chief Scindiah avenged this crime; and Lord Lake in 1803, after defeating the Mahrattas outside Delhi, placed Shah Alum in a position of comparative affluence during the three last years of his long and miserable life.

Shahan, Thomas Joseph, an American educator; born in Manchester, N. H., Sept. 11, 1857; was educated at the American College of Rome and at the Roman Seminary; studied history at the University of Berlin in 1889–1891; and was ordained in the Roman Catholic Church in 1882. He became Professor of Church History and Patrology at the Catholic University of America in 1891. His publications include: "The Blessed Virgin in the Catacombs" (1892); "Giovanni Baptista de Rossi" (1900); and special articles on church history and archæology in periodicals.

Shah Jehan, the 5th Mogul Emperor of Delhi, reigned from 1627 to 1658, when he was deposed by his son Aurengzebe. During his reign the Mogul empire attained a great magnificence; he founded Delhi, where he erected the celebrated peacock throne, valued at $32,500,000; built the Taj Mahal at Agra, a mausoleum to his favorite wife, and several other buildings which have become architecturally famous. He died in Agra, in 1666.

Sháhjahánpur, a town in India, in the Northwest Provinces; 95 miles N. W. of Lucknow, in the executive district of the same name. There is a cantonment at the place, an American Methodist mission station with churches and schools; and sugar works in the neighborhood. Pop. (1891) 78,522.

Shahpur. See Sapor.

Shairp, John Campbell, known as Principal Shairp, a Scotch poet, critic, and essayist; born in Houstoun, Linlithgowshire, Scotland, July 30, 1819. He became principal of the United College, St. Andrews. Among his works are: "Kilmahoe, a Highland Pastoral, and Other Poems" (1864); "Studies in Poetry and Philosophy" (1868); "Culture and Religion" (1870); "Poetic Interpretation of Nature" (1877); "Aspects of Poetry" (1881); and, published posthumously, "Sketches in History and Poetry" (1887); "Glen Desseray and Other Poems" (1888). He died in Ormsary, Argyllshire, Sept. 18, 1885.

Shakers, a name given to an American sect of celibates of both sexes, founded by Ann Lee, an English emigrant, about 1776, from their using a kind of dance in their religious exercises, but who call themselves the United Society of Believers in Christ's Second Appearing. Their chief settlement is at Mount Lebanon, N. Y. Their foundress was called the Elect Lady, and Mother of all the Elect, and claimed to be the wo-

man mentioned in Rev. xii. The Shakers profess to have passed through death and the resurrection into a state of grace — the resurrection order, in which the love which leads to marriage is not allowed, and are known as brothers and sisters. They abstain from wine and pork, live on the land and shun towns. They cultivate the virtues of sobriety, prudence, and meekness, take no oaths, deprecate law, avoid contention, and repudiate war. They affect to hold communion with the dead, and believe in angels and spirits, not as a theological dogma, but as a practical fact. In many of their ideas the Shakers would appear to be followers of the Essenes. Their Church is based on these grand ideas: The kingdom of heaven has come, Christ has actually appeared on earth; the personal rule of God has been restored; the old law is abolished; the command to multiply has ceased; Adam's sin has been atoned; the intercourse of heaven and earth has been restored; the curse is taken away from labor; the earth, and all that is on it, will be redeemed; angels and spirits have become, as of old, the familiars and ministers of men.

The name was also applied to an English Millenarian sect founded by Mrs. Mary Anne Girling, who gave out that she was a new incarnation of the Deity, and could never die. Her followers established a community on the borders of the New Forest; but Mrs. Girling died on Sept. 18, 1886, and her followers dispersed.

WILLIAM SHAKESPEARE, FROM A STATUE.

Shakespeare, William, an English dramatist and poet; born in Stratford-on Avon, Warwickshire, England, in April, 1564. His father was John Shakespeare, a well-to-do inhabitant of Stratford, probably glover, grazier, and dealer in wool, owner of landed property, alderman, and in 1568 chief magistrate of Stratford. His mother was Mary Arden, of an ancient and wealthy family, but of whom personally nothing whatever is known. His name appears in the forms as Shakspeare, Shakespeare, S h a k s p e r e, Shakspur, Shagspur, Saxpere, Chaksper, and with other variations, and is spelt differently by himself on different occasions. His birthplace, as pointed out by traditions, is the house in Henley street, Stratford, which belonged to his father. But his father owned several other houses, and there is no evidence to show where he lived in 1564. Shakespeare was educated at the free grammar school of Stratford, where he probably remained from the age of 7 to about 14. During his boyhood Stratford was frequently visited by companies of strolling players, whose performances doubtless first attracted him to the stage. The beautiful scenery of the Avon, and the places of historical interest in the neighborhood, could not fail to influence his fine and sensitive nature. In his 19th year he married Anne Hathaway, daughter of a yeoman at the neighboring hamlet of Shottery, and eight years older than himself.

Shakespeare

Among the many suspicious stories told of Shakespeare's early life, one is of a drinking challenge made by a club at Bidford, called "The Topers," and accepted by him and his comrades; and of his sleeping off the effects of the bout under a crab tree on the way home. More celebrated is the tale of his taking part in stealing deer from the park of Sir Thomas Lucy at Charlecott, and of his detection and prosecution. This affair is said to have been the immediate occasion of his going to London, about 1586. It is quite as probable that nuptial disappointments and dissatisfaction may have driven him from home; and very natural that his course should be to the metropolis, with its large, full, and fascinating life. It is certain that he did go to London, and lived there many years, leaving his wife and children at Stratford; that he gained an honorable position as actor, playwriter, and shareholder in the theater of Blackfriars, and afterward in that of the Globe; enjoyed the favor and patronage of Queen Elizabeth, James I., and the Earl of Southampton, the warm friendship of Ben Jonson, and the highest respect and admiration of his associates, not only for his preëminence as a poet, but for his honesty, geniality, and worth as a man.

Shakespeare gained also wealth, and became the purchaser of the house at Stratford called New Place, and afterward of a large estate which he annexed to it. It was his ambition to found a family, and it was probably by his desire that his father, in 1597, obtained a grant of arms from the Heralds' College, and, subsequently, permission to impale the arms of Shakespeare with those of Arden. During his residence in London he is said to have visited his native town annually, and he returned to spend his last years there, perhaps about 1604. Enjoying the dignified ease of the country gentleman, the highest respect of his countrymen, and the sweets of the rare wisdom to which he had attained, he awaited the end; not ceasing to write, but producing in those quiet years some of his grandest works. Of his end we have no other account than the short statement in the diary of the Rev. John Ward, vicar of Stratford, that "Shakespeare, Drayton, and Ben Jonson had a merry meeting, and it seems drank too hard, for Shakespeare died of a fever then contracted." The date of his death is April 23, 1616. Two days after, his remains were buried in the chancel of Trinity church, Stratford, and his well known bust was executed and placed near the spot within seven years.

Besides his first child, Susanna, Shakespeare's only other children were a boy and a girl, twins, born in 1585. Susanna married Dr. Hall, a physician of Stratford, in 1607, was left a widow in 1635, and died in 1640. She had one child only, a daughter, who, though twice married, left no children. Of the twins, the boy, named Hamnet, died at the age of 11, and the girl, Judith, married Thomas Quincy, and had three sons, who all died childless. Though there is no proof that Shakespeare ever sat to a painter, portraits of him exist; but they curiously differ, and only three are thought of much importance, viz., that engraved by Martin Droeshout for the folio of 1623; the Chandos portrait; and that preserved in the museum at his birthplace. The bust is probably the best authenticated likeness. The Chandos portrait was presented by the Earl of Ellesmere, in 1856, to the London National Portrait Gallery.

The first collected edition of Shakespeare's plays was the folio of 1623. His poems of "Venus and Adonis," and "The Rape of Lucrece," were published in 1593 and 1594, and were the only works which appeared with his name in his lifetime. Of the 36 plays (exclusive of "Pericles"), the dates of publication of only a few are known. "The Two Gentlemen of Verona," and "Love's Labors Lost," were among the earliest; and "Tempest," "Troilus and Cressida," "Henry VIII.," "Coriolanus," "Julius Cæsar," and "Antony and Cleopatra" among the latest. The "Midsummer Night's Dream," "Merchant of Venice," "Romeo and Juliet," "Richard II.," "Richard III.," "Henry IV.," and "King John" were all produced before 1598. A copy of "Hamlet" is extant, bearing the date 1602. "Twelfth Night" was produced in 1601; "King Lear" was printed in 1607; the "Tempest" was written in 1611. The second folio edition of the collected plays appeared in 1632, and two others subsequently. It is said that by 1830 not less than 82 editions had been published, without including separate plays, and poems, and commentaries. Since then the number has been enormously increased. The works of Shakespeare have become, to a large part of the world, one of the primal necessities of life. In no other man's books, probably, is to be found so much truth, wisdom, and beauty as in his. Great to all men, he is greatest to the great, the homage of the highest intellects of the world is silently, or with eloquent speech, yielded to him. The myriad-minded man, the greatest intellect; who in our recorded world has left such a record of himself in the way of literature; the poet of the human race; the melodious priest of a true Catholicism; such are some of the phrases in which other great men have striven to express their sense of his superiority. Ben Jonson, Milton, Dryden, Pope, and later Coleridge. De Quincey, Carlyle, and Emerson, have led the chorus of his praise. In Germany, Lessing revived the knowledge of his works; and after him, Herder, Tieck, Wieland, Schlegel, and

Goethe have contributed to establish his supremacy. The most important of recent contributions to the critical study of Shakespeare is the Commentary of Professor Gervinus, of which an English translation has appeared. Another valuable critical work is Dr. Hermann Ulrici's "Shakespeare's Dramatic Art," also translated. A Shakespeare Jubilee, the first celebration of the kind in England, was suggested and carried out at Stratford by David Garrick, Sept. 6–8, 1769. A similar celebration took place under the auspices of the Shakespeare Club in 1824, and was appointed to be held annually. In April, 1864, a Tercentenary Festival, with dramatic performances, exhibition of relics, and even sermons, was held at Stratford. An attempt was made to get up a national subscription for a monument to the poet but it failed miserably. In Germany, one result of the centenary movement was the formation of a Shakespeare Society, which is to publish annually a volume devoted to Shakespearean subjects. Among the many editors of the works of Shakespeare may be mentioned Dryden, Pope, Sir T. Hanmer, Warburton, Steevens, Malone, Dr. Johnson, Coleridge, Dr. Chalmers, Hazlitt, Collier, Dyce, C. Knight, C. Lamb, Halliwell, Craik, Guizot, Mrs. Jameson, Henry N. Hudson, R. G. White, H. H. Furness, etc.

Shale, a cod or pod; a shell; a husk; as the shale of a bean. In geology, an indurated clay, which often forms beds in the coal measures. It is chiefly composed of silica and alumina, in variable proportions, but also frequently contains a considerable amount of carbonate of lime and oxide of iron. It is of a gray or grayish-black color, or brownish-red when containing much iron. Its structure is more or less slaty. It is soft, and easily reduced to powder. It is used for making slate pencils. When free from lime and iron, it is reduced to powder, and used for making fire bricks, for which it affords an excellent material. Shale very often contains a notable quantity of bitumen, and when this is so much the case that the mineral has a shining resinous streak, and crackles and blazes in the fire, emitting a black smoke and a bituminous odor, it is known as bituminous shale, and from it may be distilled an oil known as shale oil, used for illuminating purposes.

Shaler, Nathaniel Southgate, an American geologist; born near Newport, Ky., Feb. 20, 1841. He served two years as an artillery officer in the Union army during the Civil War; was instructor in zoölogy and geology at the Lawrence Scientific School, Harvard, in 1868–1872; Professor of Palæontology in 1868–1887; then Professor of Geology; dean of Lawrence Scientific School; and after 1884 geologist in charge of Atlantic Division United States Geological Survey. Among his works are the "Kentucky Geological Reports and Memoirs" (7 vols. 1876–1882); "On the Nature of Intellectual Property and its Importance to the State" (1878); "Aspects of the Earth" (1889); "The Story of our Continent" (1892); "Nature and Man in North America" (1892); "The Interpretation of Nature" (1893); "Sea and Land" (1894); "The United States of America" (2 vols. 1894); "The Individual: Study of Life and Death" (1900); and reports of United States Geological Survey on Marine Marshes, Fresh-Water Swamps, Soils, Harbors, etc. He died April 10, 1906.

Shalkot. See QUETTA.

Shalloon, a light woolen stuff said to derive its name from Châlons in France, where it was originally manufactured.

Shallop, a light fishing-vessel with two masts and carrying lug or fore-and-aft sails; also a SLOOP (*q. v.*); or a boat for one or two rowers.

Shallot, a plant, the *Allium ascalonicum,* a species of onion, the mildest cultivated. It is sufficiently hardy to endure the severest winters. The shallot is used to season soups and made dishes, and makes a good addition in sauces, salads, and pickles.

Shamanism, a form of religion practised in Siberia, though Lubbock remarks that the phase of thought is widely distributed, and seems to be a necessary stage in the progress of religious development. There is no system of belief, and the only religious ceremonies consist in the Shamans working themselves into a fury, and supposing or pretending that they are inspired by the spirit in whose name they speak, and through whose inspiration they are enabled to answer questions and foretell the future.

Shamokin, a borough in Northumberland co., Pa.; on the Philadelphia and Reading, the Northern Central, and the Lehigh Valley railroads; 18 miles S. E. of Sunbury. It is located in the anthracite coal section. Here are electric lights, electric railroads, waterworks, National and State banks, and daily and weekly newspapers. The borough has machine shops, foundries, and a number of mines, and an assessed property valuation of over $1,600,000. Pop. (1890) 14,403; (1900) 18,202; (1910) 19,588.

Shamoying. See LEATHER.

Shamoy Leather. See CHAMOIS LEATHER.

Shampooing, the name given in the East Indies to a process connected with bathing, in which the whole body is pressed and kneaded by the hands of the attendants. In

the United States the term is applied to the thorough cleansing of the scalp by lathering, rubbing and washing.

Shamrock, a ternate-leaved plant, adopted by the Irish as their national emblem. Many and warm have been the disputes to determine the veritable shamrock. Some writers contend for the *Oxalis acetosella,* or wood sorrel, the leaves of which unfold about St. Patrick's day; while others maintain that the *Trifolium repens,* or white clover, is the favored plant. Legends make out that St. Patrick, when preaching the Gospel to the benighted inhabitants of Ireland, illustrated the great doctrine of the Trinity by the triple leaf of the shamrock. Whether he plucked the bright, green leaf of the wood sorrel, or the more familiar herbage of the white clover, cannot now be determined. The latter is, however, now generally worn by Irishmen on St. Patrick's day.

Shamyl. See SCHAMYL.

Shanghai (shang-hī′), a city and seaport of China, in the province of Kiangsu; near the junction of the Hwang-pu and the Wu-sung rivers. The Chinese city proper is inclosed within walls 24 feet high, the streets being narrow and dirty, and the buildings low, crowded, and for the most part unimportant. In 1843 Shanghai was opened as one of the five treaty ports, and an important foreign settlement is now established (with a separate government) outside the city walls. The Wu-sung here is about ¾ mile wide, and increases to over 1 mile at its outlet into the Yang-tsze, at the port of Wu-sung. Along the bank of the river extends a wide "bund" or quay, with a bulwark of stone and numerous stone jetties, for landing and loading cargo. In the foreign settlement there are a fine cathedral, municipal offices, hospitals, club house, etc. A municipal council is elected by the English and Americans, and another by the French, whose quarter is separately administered. The subjects and citizens of each nationality are under the protection of their respective consuls, and a complete judicial staff has been established, forming at Shanghai a supreme court, with jurisdiction over all British subjects in China and Japan. The Chinese authorities retain complete control over all shipping dues, duties on imports and exports, etc. Shanghai has water communication with about a third of China, and its trade since the opening of the port has become very extensive, in 1897 the imports amounting to about $92,553,430, the exports to $54,876,407. The chief imports are cottons, yarns, woolens, and opium; and the exports, silk, tea, rice, and raw cotton. The largest part of the foreign trade is in the hands of British merchants. Pop. (1905) 651,000.

Shanklin Sand, a name commonly applied to the Lower Greensand of geologists. It occupies a position between the Wealden strata and the Gault, and is typically represented in the Isle of Wight and on the coast of Kent. Its greatest thickness is about 800 feet, made up of calcareous sandstones, sands, and clays. The latter are in many cases used as fuller's earth. The fossils are numerous and chiefly marine, though remains of reptiles, such as *Iguanodon mantelli,* are occasionally found.

Shanks, William Franklin Gore, an American journalist; born in Shelbyville, Ky., April 20, 1837. He was war correspondent for the New York "Herald" (1861–1865); subsequently editorially connected with the same paper, with "Harper's Weekly," the New York "Times," "Tribune," and "Daily Star"; in 1880 organized the National Press Intelligence Company; in 1891 established "The Daily and Weekly Bond Buyer," which he owned and edited. During the Civil War he served as volunteer aide-de-camp on the staffs of Generals Rousseau and Thomas, and was wounded at the battle of Chickamauga. He was imprisoned for refusing to divulge the name of a writer of an article in the New York "Tribune." Besides his contributions to periodicals he published: "Recollections of Distinguished Generals" (1865); "Bench and Bar" (1868); a play, "A Noble Treason" (1876); and "The Ring Master," a novel. He died Feb. 22, 1905.

Shannon, a large river in the W. of Ireland, and one of the finest in the British Islands. It has a length of 220 miles, and is divided into the Upper and Lower Shannon. The Upper Shannon, by far the longest and narrowest part of the river, rises in the mountains of Ulster, at the N. W. extremity of the county of Cavan from the Kulkeah Mountains, and flowing S. enters and passes through Lough Allen, till, quitting the county of Leitrim, it flows S. and E. and S. W. to the town of Banagher, forming from this portion of its course the boundary between Connaught and Leinster. From Banagher the river has first a S. W. and then a S. course, till, a little above the city of Limerick, it divides into two branches,, which, flowing round King's Island, the most ancient part of the city, unite below to form the Lower Shannon. From its rise in Cavan to its encircling the King's Island, the river has a length of 180 miles. In this course the river is greatly interrupted by shallows, falls, and rocks, impeding all navigation; many canals, however, have been constructed to overcome these difficulties, and connect the clearer portions of channel. The Lower Shannon, from Limerick to the mouth of its estuary in the Atlantic, has a length of 40 miles and a breadth of from 1 to 7 miles; though the channel in places is obstructed by islands, rocks, and shoals. It has, however, good

anchorage everywhere, and forms a harbor of refuge for ships against the force of W. gales.

Shanny, or **Shan,** a fish, the *Blennius pholius,* sometimes called the smooth blenny. It is about four inches long, olive-green, with irregular black spots. There is no crest-like appendage on the head, and the notched dorsal is not continuous with the caudal fin. The incisors are long, and serve to detach limpets and mussels from the rocks. The shanny will endure fresh water for a short time, and will live for many days out of water in places if the ground is moist.

Shansi, an inland province of Northern China; area, 81,830 square miles; pop. (1902) 12,200,456; is the original seat of the Chinese people, and in its lowland parts is well cultivated. The rivers, which are almost all tributaries of the Yellow river, are numerous, but not large. The chief grain crops are wheat and millet, and there are coal, iron, copper, and other minerals. Capital, Tai-yuen-foo.

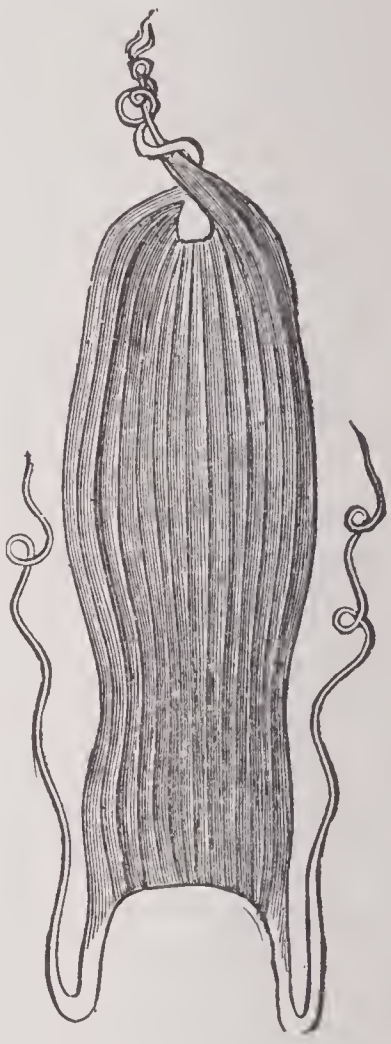
Shan States, a number of tributary States in Indo-China, between Munnipur on the W. and Yunnan on the E., and from the parallel of lat. 24° N. S. to Bangkok and Cambodia. Of these the Northern States are tributary to Burma, and the Southern to Siam. A great portion of the mountainous region of these States is called the Laos Country, and is inhabited toward the N. by the Black-bellies, so called from the circumstance that they tattoo themselves with figures in ink, and in the S. by the White-bellies, who do not tattoo. Xiengmai the capital of Laos stands on a wide plain on the Meinam, 500 miles N. of Bangkok, and is said to contain 50,000 inhabitants. The number of Laocians included in Siam alone is estimated at 1,000,000. They are meek, gentle, unwarlike, and superstitious. Their chief employment is agriculture; in religion they are Buddhists. Pop. Burman part (1901) 1,237,749.

Shantung, a maritime province of China; on the Yellow Sea; area 55,970 square miles; pop. (1902) 38,247,900. The greater portion of province is level. The chief river is the Yellow river, which, after traversing the province in a N. E. direction, flows into the Gulf of Peh-chih-li. Wheat, millet, and indigo are the chief products, and the manufactures include silk, hempen cloths, felt, etc. It was in this province that Confucius was born. This province contains the important harbors of Chefoo and Wei-hai-wei. See CHINA.

Shapinsay, one of the Orkney Islands of Scotland, between the islands of Stronsay and Pomona. It is about 4½ miles long and 4 miles broad; area, 6,733 acres, of which nine-tenths are under cultivation, and yield excellent crops of grain. The surface is generally flat, but at one point rises to the height of 162 feet.

Shari, a large river in Central Africa, which enters the S. side of Lake Tchad by several mouths after a course of about 700 miles from the S. E. See TCHAD, LAKE.

Shark, an English popular name for any individual of the group *Selachoidei.* The body is generally elongated; the muzzle, on the under side of which the nostrils are placed, projects over the mouth, and the males have claspers (with the function of intermittent organs) attached to the ventral fins. The ova are large and few in number, impregnated, and in some genera developed, within an uterine cavity; in others deposited in a tough, horny case, from which the young fish, carrying a yolk-bag, for its nourishment till it is able to seek food, is discharged; in this stage the gill-laminæ are prolonged into filaments projecting beyond the gill-cavities, but these are soon absorbed. The teeth are generally large, sharp, and formed for cutting, often with serrated edges, but in some genera they form a solid pavement-like mass. Sharks are scaleless, and the skin is usually very rough (see SHAGREEN). They are most numerous in tropical seas, becoming scarcer as they recede from the warmer regions, a few only reaching the Arctic circle. They are rapid swimmers, with great power of endurance; the larger sharks are exclusively carnivorous, and some of them extremely dangerous to man. They scent their food from a distance, and are readily attracted by the smell of blood or decomposing bodies. The smaller sharks are popularly known as dog fishes or hounds, and, though not dangerous to man, do great damage to fishermen's lines and nets. The flesh of sharks is coarse, but it is sometimes eaten; the Chinese use sharks' fins for making thick gelatinous soups, and the liver yields an oil, for the sake of which a shark fishery is prosecuted on the coast of Ceylon. Their



EGG OF SHARK (SCYLLIUM CHILENSE).

rough skin is employed by joiners to polish fine-grained wood, and by cutlers to cover the hilts of swords to make them firmer in the grasp.

Sharon Springs, a village in Schoharie co., N. Y.; on the Delaware and Hudson railroad; 59 miles W. by N. of Albany. It is located in a narrow valley, 1,100 feet above sea-level, and is surrounded by high hills. It contains four famous mineral springs, a blue sulphur, white sulphur, chalybeate, and magnesia springs, which with its favorable and picturesque location make it a popular summer resort. Pop. (1905) 526; in summer over 10,000.

Sharp, in music, a sign, which, when prefixed to a note, elevates it by a semitone in the scale. When placed at the beginning of a piece of music, it denotes that all the notes on the line or space on which it is placed, and their octaves above and below, are to be played sharp. A double sharp × raises a note two semitones.

Sharp, Granville, an English abolitionist; son of the archdeacon of Northumberland; born in Durham, England, in 1734. He went to London, and, after studying law, obtained a post in the Ordnance Office; but this he resigned in 1777 on the outbreak of the war with America, of which he disapproved. He was the author of upward of 61 publications, but his principal writings and the main labors of his life were in defense of the negro, and for the abolition of the slave trade and slavery. He was with Clarkson one of the founders of the Association for the Abolition of Negro Slavery, and assisted in the establishment of the colony of Sierra Leone for freedmen. He died in London, July 6, 1813.

Sharp, James, a Scotch prelate; born in Castle Banff, May 4, 1618. He was appointed to the parish of Crail, and was soon recognized as a leader of the moderate party in the church, on whose behalf he visited London as one of their deputies to Cromwell. He was afterward intrusted with a mission to Monk in favor of the Restoration, and the latter sent him to Breda to meet Charles II. On his return to Scotland (1660) he was rewarded by being appointed professor of theology in St. Andrews, and chaplain to the King of Scotland. In 1661 Parliament met and established Episcopacy, and he was shortly afterward appointed archbishop of St. Andrews. His persecutions of the Covenanters made him detested by that party, and May 3, 1679, he was waylaid and murdered on Magus Moor, Fifeshire, by a party of his enemies headed by John Balfour of Burley.

Sharp, William (Fiona Macleod), a Scottish poet, novelist, and critic; born near Paisley, Sept. 12, 1856. He was educated at Glasgow University, and afterwards traveled in Australia and about the Pacific, mainly to regain impaired health. In 1879 he settled in London, where he met Dante Gabriel Rossetti (*q. v.*) and Philip Bourke Marston (*q. v.*), whose biographies he later wrote. From the year 1881 he devoted himself to literature, and became a prolific writer. Under his own name he published volumes of poetry, fiction, biography, and criticism, among which may be cited: "Earth's Voices" (1884); "Romantic Ballads" (1886); "The Sport of Chance" (1888); "Children of To-morrow" (1889); "Sospiri di Roma" (1891); "A Fellowe and His Wife" (1892); "Flower o' the Vine" (1894); "Vistas" (1894); "The Gipsy Christ" (1895); "Madge o' the Pool" (1896); "Lyrical Poems" (1901); "Sospiri d'Italia" (1903); "Literary Geography" (1905). But his reputation will rest upon work given to the world under the name of "Fiona Macleod," a pseudonym carefully sustained during his lifetime. These books include: "Pharaïs" (1894); "The Sin Eater" (1895); "The Washer of the Ford" (1896); "Green Fire" (1896); "From the Hills of Dream" (1897); "The Dominion of Dreams" (1899); "The Divine Adventure" (1900); "Celtic" (1901); "The Silence of Amor" (1902); "By Sundown Shores" (1902); "Wind and Wave" (1902); "The House of Usna" (1903); "Deirdrè" (1903), and "The Winged Destiny" (1904). He died Dec. 12, 1905.

Sharpless, James, an American artist; born in England about 1751; came to the United States in 1794 and began the making of pastel portraits. Among his sitters were Washington, Jefferson, Monroe, Burr, Hamilton and other prominent Americans. These portraits, about 40 in all, were placed in the National Museum in Independence Hall, Philadelphia, in 1876. He died in New York city, Feb. 26, 1811.

Sharpsburg. See Antietam.

Sharpsburg, a borough in Allegheny co., Pa.; on the Allegheny river, and on the Pennsylvania and the Pittsburg and Western railroads; 5 miles N. E. of Pittsburg. Here are public and private schools, a State bank, and a number of weekly newspapers. The borough contains numerous coal mines, foundries, rolling mills, and iron furnaces. Pop. (1900) 6,842; (1910) 8,153.

Sharswood, George, an American jurist; born in Philadelphia, Pa., July 7, 1810; was graduated at the University of Pennsylvania in 1828 and admitted to the bar in 1831. He held a seat in the Legislature in 1837-1838 and in 1842-1843; was appointed judge of the District Court at Philadelphia in 1845, and was its president in 1848-1867. In the latter year he became a justice of the Pennsylvania Supreme Court; and was chief justice in 1878-1882. His publications include "Professional

Ethics" (1854); "Popular Lectures on Common Law" (1856); "Sharswood's Blackstone's Commentaries" (1859); and "Lectures on Commercial Law" (1856). He also edited "Adams on Equity"; "Russell on Crimes"; "Byles on Bills"; "Starkie on Evidence"; and "Leigh's Nisi Prius." He died in Philadelphia, Pa., May 28, 1883.

Shasta, Mount, a peak in Siskiyou co., Cal., at the N. end of the Sierra Nevada. Altitude 14,350 feet. On its summit are several glaciers. The mountain is almost a perfect cone, and is an extinct volcano.

Shattuck, Harriette Robinson, an American parliamentarian; born in Lowell, Mass., Dec. 4, 1850. She studied law and in 1872 was assistant clerk of the Massachusetts House of Representatives, being the first woman to hold that position. Later she became a teacher of parliamentary law. Her publications include: "The Story of Dante's Divine Comedy" (1887); "Little Folk East and West" (1891); "The Woman's Manual of Parliamentary Law" (1891); etc.

Shaw, Albert, an American editor and economist; born in Shandon, Butler co., Ohio, July 23, 1857. He was educated at Iowa College and Johns Hopkins University. After a period of work in journalism he studied in Europe, and in 1890 he became professor of international law at Cornell University. The following year he resigned and became editor of the "American Review of Reviews." His publications include: "Icaria: a Chapter in the History of Communism" (1884); "Coöperation in the Northwest" (1888); "Municipal Government in Great Britain" (1895); and "Municipal Government in Continental Europe" (1895).

Shaw, George Bernard, a British critic, essayist, and dramatist; born in Dublin, July 26, 1856. He went to London in 1876, engaged in journalism, and became known as a brilliant writer through his articles in the "Star" and the "World," and especially by his dramatic criticism in the "Saturday Review." Before 1883 he had achieved some success as a novelist, publishing in rapid succession "The Irrational Knot," "Love Among the Artists," "Cashel Byron's Profession," and "An Unsocial Socialist." He also exerted influence as a pamphleteer and a platform speaker, advocating socialistic views, and in 1884 became a member of the Fabian Society (*q. v.*). He edited "Fabian Essays" (1889), contributing two to the collection. Of his miscellaneous essays, "The Quintessence of Ibsenism" (1891) and "The Perfect Wagnerite" (1898) are remarkable for originality of view and epigrammatic point. Though his plays were slow to win popular approval, they finally evoked international discussion. They include: "Plays, Pleasant and Unpleasant" (2 vols., 1898); "Three Plays for Puritans" (1900); "The Admirable Bashville" (1901); "Man and Superman" (1903); "How He Lied to Her Husband" (1904); "John Bull's Other Island" (1904); and "Major Barbara" (1905). Characteristic wit, irony, paradox, and extraordinary dramatic situations abound throughout these plays, which set at naught the traditions of literature and of the stage, often baffling criticism, but compelling interest, if not likewise admiration, by their display of unconventionality and cleverness.

Shaw, Henry Wheeler, an American humorist; born in Lanesborough, Mass., April 21, 1818; early went West and tried his hand at various occupations. In 1858 he settled in Poughkeepsie, N. Y., as an auctioneer, soon began writing humorous pieces for newspapers, and became widely known under his pseudonym of "Josh Billings." His grotesque phonetic spelling and homely philosophy gave an air of quaint originality to his work. His "Farmers' Allminax" (1870-80) had a remarkable sale, and his other writings met with almost equal popularity. He also won success as a lecturer, assuming a manner of awkward drollery. For many years he was a contributor to the "New York Weekly," and he wrote under the pen-name of "Uncle Esek" for the "Century Magazine." His complete works were published in 1877. He died in Monterey, Cal., Oct. 14, 1885.

Shaw, John, an American naval officer; born in Mountmellick, Ireland, in 1773. He removed to Philadelphia, Pa., in 1790, and obtained employment on a merchant vessel. He joined the United States navy as a lieutenant in 1798, and was placed in command of the schooner "Enterprise" in December, 1799. During an eight months' cruise he recaptured eleven American prizes and took five French privateers. His most severe battle was that with the "Flambeau," a vessel of 100 men and 14 guns, which he quickly forced to surrender. In August, 1807, he was promoted captain. He directed the construction of defenses at New Orleans in 1811, and subsequently performed various services, at home and abroad, with credit to his calling. He died in Philadelphia, Sept. 17, 1823.

Shaw, Lemuel, an American jurist; born in Barnstable, Mass., Jan. 9, 1781. He was graduated at Harvard in 1800, studied law, and was admitted to the bar in 1804. He practised his profession in Boston; was a member of the State senate in 1821-22 and 1828-29; and chief justice of the Massachusetts Supreme Court in 1830-60. He won a foremost place among great New England jurists, and his influence upon American applications of the English common law and upon the interpretation of constitutional law was deep and lasting. He died in Boston, March 30, 1861.

Shaw, Leslie Mortier, an American statesman; born in Morristown, Vt., Nov. 2, 1848; was graduated at Cornell College, Mt. Vernon, Ia., in 1874, and at the Iowa College of Law in 1876, and in the latter year began the practice of law in Denison, Ia. Later he became interested in banking. He gained prominence in politics, as a Republican, in 1896; was governor of Iowa in 1898-1902, and in 1902 became secretary of the treasury. He resigned in 1907.

Shaw, Robert Gould, an American soldier; born in Boston, Mass., Oct. 10, 1837. He was educated in Europe and at Harvard, and in 1859 entered business life in New York city. In 1861 he enlisted in the 7th New York regiment and went with it to Washington. In May of that year he was commissioned 2d lieutenant in the 2d Massachusetts Volunteers, and he took part in the campaigns of the Army of the Potomac, fighting at Cedar Mountain, Antietam, and elsewhere. He was promoted captain in 1862, and in 1863 was appointed colonel of the 54th Massachusetts Volunteers, the first negro regiment sent from the North. The regiment left Boston May 28, 1863, joined an expedition to Florida, and in July was attached to the forces operating against Fort Wagner, near Charleston, S. C. While leading his troops in an assault upon the works, July 18, Shaw was killed. The monument to him, executed by Saint Gaudens and erected on Boston Common, is one of the sculptor's most splendid works.

Shaw University, a coeducational institution in Raleigh, N. C., for colored students; founded in 1865 under the auspices of the Baptist Church; has collegiate, normal, theological, missionary, legal, and industrial departments; endowment and other property valued at over $200,000; volumes in the library, about 5,000; average number of faculty, 33; average student attendance, 530; graduates since opening, over 850; ordinary income, $25,000.

Shawl, a garment of high antiquity. Even the elaborately wrought and beautiful shawls of India and Persia have been continuously made from an early time. Cashmere shawls are made of pashm, the underwool of the shawl-goat of Tibet. The dyeing of the yarn is a difficult operation, most of the colors being permanent. In shawls with patterns produced by embroidery the ground is of a plain pashm fabric, and the thread used is of the same material. The loom-woven shawls are made on very primitive looms. Three or sometimes four weavers are engaged at one of these looms, and instead of using shuttles they work with numerous wooden needles (each being supplied with colored yarn), which have slightly charred ends but no eyes. The shawls are woven face downward, and the work is carried on at the back or reverse side, on which the needles hang in rows. After the threads are worked in to suit the pattern across one line of weft, they are knotted to the warp and driven firmly into their place by the reed or comb. On an average five shawls are produced on one loom in a year, but a loom may be occupied during this period with only one shawl if it is of very fine quality and of an elaborate pattern. These shawls are, however, often woven in separate pieces and so neatly joined together that a shawl so made looks as if it had been woven in one piece.

Exceptionally fine Cashmere shawls are high in price. Baden-Powell ("Manufactures of the Punjab") states that one of first-rate quality, weighing 7 pounds, will cost in that country as much as $1,500. This price is made up of the following items: Material, $150; wages of artisans, $750; duty, $350; miscellaneous expenses, $250. But in the case of an exported shawl we must add customs, duty, cost of carriage, commission to broker who manages the sale and export, something for the risk of robbery, which by some routes is great, and other incidental expenses. These shawls are, however, made as low in price as $75 for one in eight colors and of comparatively simple design.

Inferior shawls are manufactured in the Punjab by artisans who at various times have emigrated from Cashmere. They are woven at Amritsar, Ludhiana, Jalalpur, Nurpur, and a few other places. For these the fine pashm is mixed with another kind of goat's wool called *koork* from Kerman in Persia. Shawls somewhat resembling those of Cashmere, though much less costly, are largely manufactured at Kerman itself, the koork of which they are made being, like the pashm from the Tibetan goat, the underwool of the animal. But the most beautiful shawls woven in Persia are made of silk, and these too are like fine Cashmere shawls in general appearance. Both in India and Persia shawl cloth is made into tunics and other shaped articles of dress for both men and women.

The production of shawls was till recent years a very important manufacture in France, and gave occupation to a large number of designers in Paris, who not only furnished designs for those woven in their own country—chiefly at Paris, Lyons, and Nîmes—but also for shawl manufacturers in England and Austria, and even for some woven in Cashmere. Shawls of various kinds are made at different places in England, and in past years many of these were designed in the Indian style. At Paisley in Scotland, where for many years previous to 1860 the manufacture of shawls was of great importance, the trade originated in the beginning of the 19th century. They were made of silk, wool, or cotton, either separately or in combination; but

the best-known class of Paisley shawls was manufactured of fine wool and with patterns in the style of those woven in Cashmere. As many as 8,000 looms were at one time occupied in the weaving of these. Soon after the middle of the century, however, the manufacture began to decline. Tartan shawls, but chiefly of small size, for indoor or occasional wear, are still made at several places in Scotland.

The change which has taken place during the last half-century in the nature of female costume is remarkable. Tweed fabrics and other soft woolen cloths of a plain character, similar to those worn by men, have completely taken the place of the richly-patterned shawls and plaids of former days. Even in a country like Persia, where, as has been stated, shawl stuff formed part of the attire of both sexes, the characteristic native dress, so long tenaciously adhered to, is gradually being abandoned for coats and other garments of European broadcloth. The time has at last come when the shawl fabrics of Cashmere, which for many centuries have never ceased to charm the female world, are no longer in demand, and the art of manufacturing them is in danger of becoming lost.

A few words may be said about the patterns of Cashmere shawls, which have been placed by the most distinguished decorative artists of modern times in the highest order of art manufacture. The most characteristic feature in a typical design is what has been usually called the "cone" or "pine cone." It appears, however, to be really a conventional representation of a wind-bent cypress-tree, as the term *sarv*, the native name of that tree, is also applied to this pattern or part of a pattern. The form has many modifications, one or more of which often make up the groundwork of the designs of other textile fabrics both in India and Persia, and it even appears on metal work and papier-maché made in Cashmere. Sometimes it is simply called the shawl pattern. It is, however, not merely the graceful outline of their ornamental devices, but also the harmonious blending of their deep-toned colors, which gives a singular charm to these exquisite productions of Oriental looms.

Shawm, an obsolete musical instrument of the wood-wind group, having a double reed set in a capped, or globular, mouthpiece. It was through modification of the shawm that the oboe (*q. v.*) originated. On the Continent it was known as the chalumeau.

Shawnee, a city of Pottawatomie co., Okla.; on the Atchison, Topeka, and Santa Fé, the Chicago, Rock Island, and Pacific, and other railways; 39 miles E. S. E. of Oklahoma city. It has cotton gins, cotton compresses, and cotton seed oil mills. Pop. (1900) 3,462; (1910) 12,474.

Shawnee Indians, a tribe of American Indians of the Algonquin family, formerly settled mainly in New York, Pennsylvania, and Ohio, but driven W. by the Iroquois. They helped the French against the English, gave trouble to the newly-founded United States, and in 1812 some bands joined the English. They afterward removed to Missouri, Kansas, and Indian Territory.

Shays, Daniel, an American insurgent; born in Hopkinton, Mass., in 1747; served as ensign at the battle of Bunker Hill, and attained the rank of captain in the Continental army. He took a leading part in the popular movement in Western Massachusetts for the redress of alleged grievances, appearing before Springfield, Mass., at the head of 1,000 men to prevent the session of the Supreme Court at that place, and commanding the rebel party at Pellham and at the engagement with the militia at Petersham. After the rebellion was put down, however, he was pardoned by the government and later, in his old age, was allowed a pension for his services during the Revolutionary War. He died in Sparta, N. Y., Sept. 29, 1825.

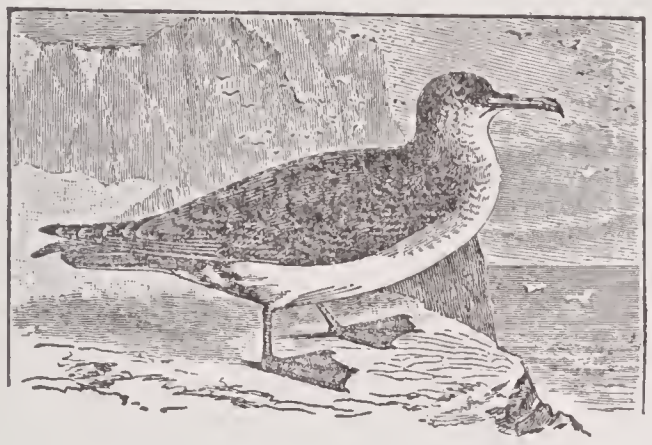
Shea, the *Bassia butyracea* of botanists, is a native of tropical Asia and Africa. The trunk of this tree, when pierced, yields a copious milky juice, and *shea* or vegetable butter is found in the nuts when crushed. The latter are the size of a pigeon's egg, and each tree yields about a bushel. See BASSIA.

Shea, John Dawson Gilmary, an American historian; born in New York city, July 22, 1824; was educated at Columbia College; studied law and was admitted to the bar, but devoted himself chiefly to literature. He edited the "Historical Magazine" in 1859–1865; was one of the founders and first president of the United States Catholic Historical Society; a member of numerous historical societies in Canada and the United States; and corresponding member of the Royal Academy of History, Madrid, Spain. His publications include "The Discovery and Explorations of the Mississippi Valley"; "The Lincoln Memorial"; "Novum Belgium, an Account of the New Netherlands"; and numerous translations of French and other works. He died in Elizabeth, N. J., Feb. 22, 1892.

Shears. See SCISSORS.

Sheartails (*Thumastura*), a genus of humming birds, of which the slender sheartail (*T. cnicura*) and Cora's shear-tail (*T. Cora*) are two familiar species. These birds occur, the former in Central America generally; the latter in Peru and in the Andes valleys. They derive their name from the elongation of the two central tail feathers of the males.

Shearwater, the name of several marine birds of the genus *Puffinus*. The great shearwater (*P. cinereus*), which is 18



THE MANX SHEARWATER.

inches long, is found on the S. W. coasts of England and Wales. They fly rapidly, skimming over the sea, from which they pick up small fishes, mollusks, etc. The name is sometimes applied to the scissor-bill or skimmer (*Rhynchops nigra*).

Sheatfish, a name applied to any fish of the family *Siluridæ*, but specifically to *Silurus glanis*, called also the sly silurus, with the exception of the sturgeon, the largest European fresh-water fish, and the only European member of the family. It is allied to the catfish. It occurs in the Rhine, and is common in Germany, Poland, Styria, the Danube, and the rivers of Southern Russia. It attains a weight of from 300 to 400 pounds, and the flesh of the young fish is firm, flaky, and well-flavored. The fat is used in dressing leather, and the air bladder is made into gelatine.

Sheath, in ordinary language, a case for the reception of a sword, or long knife, or similar instrument; a scabbard. In botany, a petiole when it embraces the branch from which it springs. Called also a vagina. The toothed sheaths of *Equisetaceæ* are formed by the coalescence of the leaves at their base. In entomology, the wing case of an insect. In hydraulic engineering, a structure of loose stone for confining a river within its banks.

Sheath Bill, in ornithology, the genus *Chionis*, made known by the naturalists of Cook's second voyage, a specimen of *C. alba* having been met with on New Year Island, on Dec. 31, 1774. It resembles a pigeon in size and general appearance; plumage pure white; bill yellow at base, passing into pink at tip; round the eyes the skin is bare, and dotted with cream-colored papillæ; legs bluish-gray. In the Falkland Islands it is called the kelp pigeon. Another species was discriminated in 1842 by Dr. Hartlaub; it is smaller than *C. alba*, with similar plumage, but having the bill and bare skin of the face black and the legs much darker. The sealers of Kerguelen Land call it the sore-eyed pigeon, from its prominent fleshy orbit.

Sheathing, that which sheathes or covers; specifically, in shipbuilding, a covering, usually thin plates of copper or an alloy containing copper, to protect the bottom of a wooden ship from worms. Lead was used for the purpose nearly 2,000 years ago.

Sheave, the grooved wheel in the shell of a block or pulley over which the rope runs. In wooden blocks, it is generally of lignum vitæ, and has a brass bushing, called a coak, which runs on the pin. In locksmithing, a sliding scutcheon for covering a keyhole.

Sheba, in ancient geography, a kingdom of South Arabia, embracing the greater part of Arabia Felix; named after Sheba, one of the sons of Jokshan, second son of Abraham and Keturah (Gen. x: 28). The Queen of Sheba visited Solomon, 990 B. C. (1 Kings x: 1–13). The Greeks and Romans called the people Sabæi, or Sabæans.

Sheboygan, a city and county-seat of Sheboygan co., Wis.; on Lake Michigan at the mouth of the Sheboygan river, and on the Chicago and Northwestern railroad; 52 miles N. of Milwaukee. Here are a United States government building, a Day School for the Deaf, an Asylum for the Chronic Insane, Home for the Friendless, public library, waterworks, street railroad and electric light plants, and several daily and weekly newspapers. Sheboygan is chiefly noted for its manufacture of chairs. Besides this industry it has stamped steel and cast-iron works, and manufactories of furniture, soap, boilers, bicycles, leather, boots and shoes, carriages and wagons, and bricks and tiles, and an assessed property valuation of nearly $12,000,000. Pop. (1890) 16,359; (1900) 22,962; (1910) 26,398.

Shechem. See NABLUS.

Shechinah, or **Shekinah,** a word not in the Old Testament, but used by the later Jews, and from them borrowed by the Christians technically to describe the visible presence of Jehovah above the merey seat and between the cherubim in the tabernacle and Solomon's temple, but absent from that built under Zerubbabel (See MERCY SEAT) (Exod. xxv: 8, Psalm lxxx: 1, etc.), though it was expected to be restored when the Messiah came (Hag. ii: 7, 9, Mal. iii: 1). The shechinah is associated with glory (Num. xiv: 10, xvi: 19, 42) which again is sometimes described as "the angel of the Lord" (Exod. xiv: 19).

Shedd, Mrs. Julia Ann (Clark), an American art writer; born in Newport, Me., Aug. 8, 1834. Besides many contributions to art periodicals, she published: "Famous Painters and Paintings" (1874); "The

Ghiberti Gates" (1876); "Famous Sculptors and Sculpture" (1881); and "Raphael," etc. (1883). She died in 1897.

Shedd, William Greenough Thayer, an American theologian; born in Acton, Mass., June 21, 1820; was graduated at the University of Vermont in 1839, and at Auburn Theological Seminary in 1843, and was ordained pastor of the Congregational Church in Brandon, Vt., in 1844. He became Professor of English Literature in the University of Vermont in 1845, which chair he held till appointed to that of Sacred Rhetoric in Auburn Theological Seminary in 1852. Subsequently he was Professor of Church History in Andover Theological Seminary; associate pastor of the Brick Church, New York city; and Professor of Biblical Literature and Theology in the Union Theological Seminary. Among his publications are "Orthodoxy and Heterodoxy"; "Commentary on Paul's Epistle to the Romans"; "The Confession of Augustine"; "Theological Essays"; "Doctrine of Endless Punishment"; etc. He died in New York city, Nov. 17, 1894.

Sheep, the common name of the genus *Ovis*, belonging to the *Cavicornia*, or hollow-horned ruminant family. Naturalists are by no means agreed as to what was the original breed of this invaluable animal, which is in modern farming almost equally important for furnishing the farm with a dressing of manure, and the community at large with mutton, clothing and other necessaries of life. Of the several varieties of wild sheep which have by naturalists been considered entitled to the distinction of being the parent stock, may be mentioned: (1) the Musmon

LINCOLN RAM.

(*O. musmon*), still found wild in the mountains of the larger islands of the Mediterranean and European Turkey; (2) the Argali (*O. ammon*), or wild Asiatic sheep, which are the tenants of the highest mountains of Central Asia, and the elevated, inhospitable plains of its N. portions; (3) the Rocky Mountain sheep (*O. montana*), which is found on the mountains of North America; (4) the bearded sheep of Africa (*O. tragelophus*), found on the high lands of Egypt and in Barbary. The leading fact in the geographical history of this genus is that it occurs both in the New and the Old World, whereas the goat tribe are naturally unknown in America. It is usually regarded by naturalists as being not only specifically, but generically, distinguished from the goat tribe; but some authorities, on the other hand, are inclined to believe that the generic separation is founded chiefly on characters which have arisen from

SHROPSHIRE RAM.

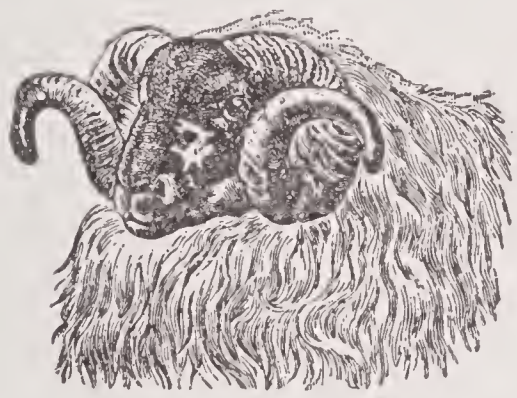
the influential power of man. In a state of nature, the sheep is scarcely less active or energetic than the goat; its dimensions are greater, its muscular strength at least equal both in force and duration. It is also an Alpine animal, and among its native fastnesses bounds from rock to rock with almost inconceivable swiftness and agility.

The main characteristics of the four unsubdued races of sheep mentioned above are as follows: The Musmon measures about three feet and a half in length, and its height, at the highest part of the back, is about two feet six inches. The neck is large, the body thick, muscular, and of a rounded form. The limbs are robust, and the hoofs short. The horns of the male are nearly two feet long. The body is protected by a short, fine, gray-colored wool, of which the filaments are spirally twisted, and by a stiffish silky hair, of no great length, yet sufficient to conceal the wool beneath. It is gregarious in a state of nature, and seldom descends from the highly-elevated portions of the mountains on which it dwells. The general opinion of naturalists is that it is from this species the domestic breeds have been obtained. The bearded sheep of Africa has the hair on the lower part of the cheeks and upper jaws extremely long, so that it forms a double or divided beard. The hairs on the sides and body are short, those on the top of the neck somewhat longer, and rather erect. The whole under-parts of the neck and shoulders are covered by coarse hair, not less than 14 inches long; and beneath the hair, on every part, there is a short genuine wool, the rudiments of a fleecy clothing.

Sheep

The tail is very short; the horns, which are about two feet long, approach each other at their base, and diverge outwards. The Argali, or wild sheep of Asia, measures about three feet in height at the shoulder, and five feet in length. His horns are nearly four feet long, and placed on the summit of the head, so as to cover the occiput. They nearly touch each other in front, bending backward and laterally, and then forward and outward. The female is of smaller size, and her horns are nearly straight. The name of Argali, applied to this species, is the Mongol name of the female; the male is called Guldschah. The *Ovis montana*, or Rocky Mountain sheep of the United States, is larger than the largest varieties of domestic breeds. The horns of the male are of great dimensions, arising a short way above the eyes, and occupying almost the entire space between the ears, but without touching each other at their bases. The hair in this species resembles that of a deer, and is short, dry, and flexible in its autumn growth; but becomes coarse, dry and brittle as the winter advances.

There is no country where more attention has been paid to the improvement of the breeds of sheep, both foreign and domestic,



BLACK-FACED RAM.

or where more success has been attained, than Great Britain. The many varieties of sheep which tenant Great Britain and Ireland may be conveniently divided into two classes; the first consisting of sheep without horns, and the second of sheep with horns. Of the first class are, the New Leicester sheep, the characteristics of which are fineness and fullness of form, an early maturity and propensity to fatten, a diminution in the proportion of offal, and the return of most money for the quantity of food consumed; the wool, not so long as in some breeds, but considerably finer. The Cotswold sheep, which have been long celebrated for the fineness of their wool, and which have been gradually improved by crossing with the Leicester sheep. Their mutton is fine-grained and full-sized. The Dartmoor sheep, which have white faces and legs, some with and some without horns, small in the head and neck, and generally small-boned, carcass narrow and flat-sided. The Southdown sheep, which takes its name from a tract of down extending more than 60 miles in length, through parts of the counties of Sussex, Surrey, and Kent. The wool is short, close, and curled, and free from spiry projecting hairs. The flesh is finely grained and of good flavor. The Romney-Marsh sheep, which have long but coarse wool, much internal fat, and much hardihood, and require no artificial food during the hardest winter but a little hay. The Cheviot sheep are a peculiar breed, which are kept on the extensive range of the Cheviot hills. They have the face and legs generally white, and the body long; their wool is short, thick, and fine; they possess very considerable fattening qualities, and can endure much hardship both from starvation and cold. Of the horned sheep, the chief varieties are: The Dorset sheep. They are a good folding sheep, and their mutton is well flavored, but their principal distinction and value is the forwardness of the ewes, who take the ram at a much earlier period of the year than any other species, and thus supply the market with lamb at the time when it fetches the highest price. The Shetland sheep are small and handsome; hornless, hardy, feeding on even sea-weed, and with soft and cottony wool. The Hebridean sheep is the smallest of its kind, even when fat weighing only 20 pounds.

The most important breed of sheep as regards the texture of the wool is the Merino (*O. hispanica*), in modern times brought to the greatest perfection in Spain, though their originals probably formed the flocks of the patriarchs thousands of years ago, and have been the stock of all the fine-wooled sheep. Unlike the British breeds, they have wool on the forehead and cheeks; the horns are very large and heavy, and convoluted laterally; the wool is fine, long, soft, twisted, in silky spiral ringlets, and naturally so oily that the fleece looks dingy and unclean from the dust and dirt adhering to the outside, but perfectly white underneath; the form is not so symmetrical as in many English breeds, and there is generally a loose skin hanging from the neck. They readily form cross breeds, called demi-merinos, which have been brought to great perfection in France, whence, as well as from Spain, they have been imported into the United States. Of the other remarkable varieties of the genus *Ovis* in different parts of the world, we may mention the fat-tailed sheep, common in Tartary, Arabia, Persia, and Egypt, the tail of which is so loaded with fat that it alone frequently weighs 20 pounds. The many-horned sheep of Iceland, and the most N. part of the Russian dominions, which has three, four, or

five horns, sometimes placed with great regularity, and sometimes differing in proportion and situation. The Cretan sheep, chiefly found in the island of Crete, but kept in many parts of Europe on account of the strangeness of the appearance of its horns, which are remarkably large, long, and spiral; those of the males being upright, and those of the females at right angles to the head. The fat-rumped tailless sheep met with in all the deserts of Tartary, and which have long legs, a somewhat arched visage, horns, in the male, like those of the domestic sheep, large pendent ears, and a tail so enveloped in fat as to be scarcely visible. The African or Guinea sheep, a native of all the tropical climates, both of Africa and the East. The distinguishing characteristics are — a rough, hairy skin, short horns, pendulous ears, a kind of dewlap under its chin, and a long mane, which reaches below the neck. Different names are given to the sheep, according to its sex and age. The male is called a ram or tup. After weaning, he is said to be a hog, hogget, or hoggerel, a lamb-hog, or tup hog or teg; and if castrated, a wether-hog. After shearing, he is called a shear-hog, or shearing, or dimmort, or tup. After the second shearing, he is a two-shear ram; and so on. The female is a ewe or gimmer-lamb till weaned, and then a gimmer, or ewe-hog, or teg. After being shorn, she is a shearing-ewe or gimmen, or theave, or double-toothed ewe; and after that a two-, or three-, or four-shear ewe or theave. The age of the sheep is reckoned, not from the period of their being dropped, but from the first shearing. The total number of sheep in the United States on Jan. 1, 1910, was 57,216,000; average price per head, $4.08; total value, $233,664,000.

Black sheep is a figurative term to denote a person who is, as it were, outlawed from society, by reason of his misdeeds or moral obliquities.

Sheep Dipping. The advantages resulting from the dipping of sheep are known and appreciated in all countries. Where the custom has been in vogue the longest, there it is now the most general — the best possible evidence of its value. When flocks are afflicted by disease or insects, it furnishes a barrier against loss, while its beneficial influence on the growth of wool and general health of the flock make it more of an investment than an expense. Dipping for the sole purpose of increasing the yield of wool is now quite common, because it is found profitable. In the older countries, on every well conducted farm the flock is dipped regularly once or twice every year. At a small outlay of a cent or two a head, the flock is rendered proof against insects and parasites, and the animal, thriving undisturbed, puts on the maximum amount of flesh. Disease is little known wherever the practice of periodical dipping prevails. Moreover, the gain in the increased growth of wool more than compensates for the expense. A sheep tortured by the biting of insects cannot thrive properly, and incurs a direct loss to the owner. All sheep should be dipped within a month or six weeks after shearing, and again in the fall, to insure perfect comfort during the winter. Lambs should be dipped when the ewes are shorn, to prevent the ticks passing on to them for the better covering afforded.

Show sheep should be dipped a month before exhibition, and so made proof against infection on the cars or in the show yard. Newly-bought sheep should always be dipped before turning them out on the ranch or farm. Rams should be closely watched, and kept clean. By the adoption of these methods disease can be kept at bay. Lime and sulphur as a dip is generally denounced, as it ruins the fleece; tobacco stains it, and requires heating to be effective. Carbolic acid and other liquids are only temporarily effective, and usually very unpleasant in use. Kerosene emulsion is very risky, and often peels the wool. All hot dips are objectionable and liable to chill the sheep. Undoubtedly a first-class manufactured dip is the cheapest preparation to use. Where scab exists in the flock two dippings, at a close interval, are necessary to effect a thorough cure. Scab is a skin disease; the parasites live in the skin and deposit their eggs there, therefore the skin must be saturated. The owner should examine the first sheep dipped and satisfy himself that a sufficient contact has been secured, whatever be the remedy applied. It takes a little time, especially if the wool be long, but it is more economical to do the thing right at first. If a sheep carrying six or eight months' wool be passed through a vat in 10 or 15 seconds, there can be no proper contact, the liquid not having time to penetrate through the thick, greasy fleece to the skin. In Australia, South America, South Africa and other countries, dipping is largely practised with the sole object of invigorating the growth of wool, and the most critical tests have shown it to be a highly remunerative practice. The records of the London Wool Exchange show that dipped wool always fetches better prices. In Australia the dipping stations are very elaborate, and the operation carried out in every detail, with thoroughness, from a deep sense of its profitableness when properly done.

Sheep Dog. See Shepherd's Dog.

Sheep's-Head, the name of a fish (*Sparus ovis*) caught on the shores of Connecticut and Long Island. It is allied to the gilt-head and the bream, and is considered a delicious food. It receives its name from

the resemblance of its head to that of a sheep.

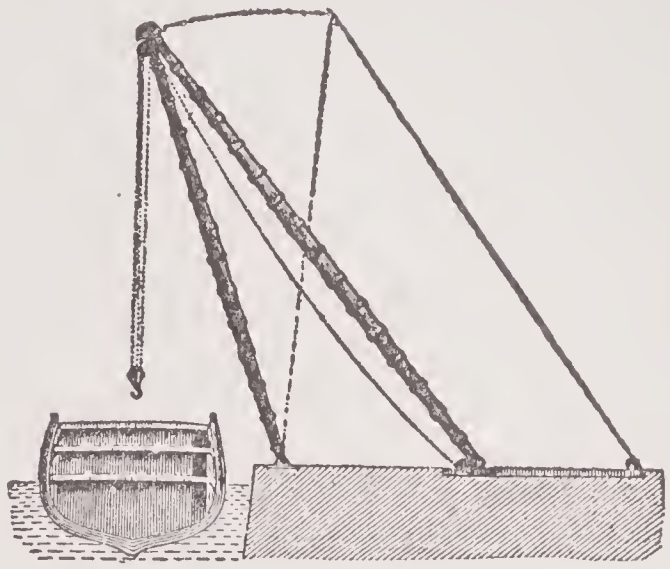
Sheep Tick, a well-known dipterous insect (*Melophagus ovīnus*) belonging to the family *Hippoboscidæ* or horse flies. The pupæ produced from the eggs are shining oval bodies which become attached to the wool of the sheep. From these issue the tick, which is horny, bristly, of a rusty ochre color, and wingless. It fixes its head in the skin of the sheep and extracts the blood, leaving a large round tumor. Called also sheep louse.

Sheer, in shipbuilding, the upward curvature of the lines of a vessel toward the bow and stern. Sharp vessels generally have more than full-built ones; small vessels more than large ones; and merchantmen more than men-of-war. When the deck is perfectly flush from stem to stern, a vessel is said to have a straight sheer. Also, the after-strake of a vessel. As a nautical term, the position of a ship riding at single anchor with the anchor ahead. When riding at short scope of cable, when she swings at right angles to the cable, exposing a larger surface to the wind or current, and causing the anchor to drag, she is said to break her sheer.

To quicken the sheer: In shipbuilding, to shorten the radius which strikes out the curve. To straighten the sheer is to lengthen the radius.

Sheerness, a seaport and royal dockyard in Kent, England; 52 miles E. of London; occupies the N. W. angle of the Isle of Sheppey, and thus commands the mouths of the Thames and Medway. It consists of the four suburbs of Blue Town, Mile Town, Banks Town, and Marina, the last of which is growing to be a favorite watering place, while the first contains the dockyard and is strongly fortified. Sheerness has two churches, a Roman Catholic chapel (1864), designed by E. W. Pugin in Second Pointed style, large naval and military barracks, a pier 3,000 feet long, and a sea-water bath with an area of 11,259 square feet. The dockyard, covering 60 acres, comprises a wet dock of 3½ acres, two others of smaller size, three dry docks, each 248 feet long by 88 feet wide, etc. Captured by the Dutch under De Ruyter in 1667, Sheerness was shortly after fortified, but the dockyard was not commenced till 1814, since which time more than $15,000,000 has been expended on its construction. Pop. (1901) 18,179.

Sheers, or **Shears,** in nautical language, an apparatus consisting of two masts or legs, secured together at the top, and provided with ropes or chains and pulleys; used principally for masting or dismantling ships, hoisting in and taking out boilers, etc. The legs are separated at their feet to form an extended base and are lashed together at their upper ends, to which the guy ropes and tackle are attached. The sheers have one motion on the steps describing an arc, and are inclined from the perpendicular to a greater or less extent as required, by slacking or hauling on the guy rope or fall of the



SHEERS

sheer tackle. Temporary sheers are made of two spars lashed together at the top and sustained by guys. Permanent sheers are sloped together at top and crowned with an iron cap bolted thereto. They are now usually mounted on a wharf, but were formerly placed on a sheer hulk.

Sheet, in ordinary language, a large, broad, and thin piece of anything, as paper, linen, glass, iron, etc.; specifically, (1) A broad and large piece of cloth, as of linen or cotton, used as part of the furniture of a bed. (2) A broad piece of paper, either unfolded as it comes from the manufacturer, or folded into pages. Sheets of paper are of various sizes; as royal, demy, foolscap, etc. (see PAPER). (3) A sail. Also anything expanded; a broad expanse or surface. As a nautical term, a rope attached to the clew of a sail in order to extend it. Lower square sails, or courses, have another rope, the TACK (*q. v.*). A sheet in the wind, slightly intoxicated; somewhat tipsy. In sheets: In printing, lying flat or expanded; not folded, or folded but not bound (said especially of printed pages).

Sheffield, a municipal and parliamentary borough of England, county of York (West Riding); on hilly ground at the junction of the Sheaf and Don, about 160 miles N. of London. The site of the town was originally confined to the angle formed by the Sheaf and Don, but it now extends along the slopes above these rivers and their tributaries, the Loxley, Rivelin, and Porter. In the central parts great improvements have recently been made in the crowded streets by the corporation, and the suburban districts are well built and picturesquely situated. The chief ecclesiastical building is the ancient parish church of St. Peter's

in the Perpendicular style, and recently restored. Of educational and literary institutions there are the Free Grammar School, the Church of England Educational Institute, the Firth College, the Wesley College, Ranmoor College, the School of Art, and the St. George's Museum founded by Mr. Ruskin. The principal buildings are the town hall, the Cutlers' Hall, the corn exchange, the music hall, and the Albert Hall. There are numerous hospitals and charitable institutions. The town is well supplied with parks, chief of these being the Norfolk, Firth, and Weston parks, the latter of which includes a museum and the Mappin Art Gallery. The trade of Sheffield is chiefly connected with cutlery, for which it has long been famous, and the manufacture of all forms of steel, iron, and brass work. The steel manufacture includes armor plating, rails, engine castings, rifles, etc. There are also manufactures of engines, machinery, plated goods, Britannia-metal goods, optical instruments, stoves and grates, etc. Parliamentary sanction has been given to a scheme which proposes to connect Sheffield with the port of Goole by means of a navigable highway suitable for ships. Sheffield is supposed to have been originally a Roman station. Edward I. granted it a charter as a market town in 1296, and there is indication in Chaucer's writings that the town was then noted for its cutlery. But it was only after the beginning of the 19th century that it developed such importance as a manufacturing center. The chief modern event in its history was the terrible disaster in 1864, occasioned by the bursting of Bradfield Reservoir. The parliamentary divisions of the town are: Central, Attercliffe, Brightside, Hallam, and Ecclesall, for each of which it returns one member. Pop. (1901) 380,717.

Sheik, or **Sheikh** (Arabian, an elder, a chief), the head of a Bedouin family of importance with its retainers, or of a clan or tribe. He is sovereign within the portion of the desert occupied or traversed by his people, but, if too despotic, can be kept within bounds by the knowledge that a portion of his clan may transfer its allegiance to some other sheik. When war exists, the sheiks of a region confederate together and choose one of their number as a sheik or chief. The position of Abraham with his allies, Abner and Eshcol of Mamre, much resembled that of an Arab sheik with his confederates (Gen. xiv: 13, 14). When a traveler passes through the territories of a sheik he pays for guidance and safe conduct, a process which requires repetition whenever the petty dominions of some new sheik are reached.

Sheil, Richard Lalor, an Irish orator; born in Drumdowney, near Waterford, Tipperary, Ireland, Aug. 17, 1791. Second to O'Connell alone, Sheil often surpassed even the "Agitator" himself in his powers of captivation, from the beauty of his language and the grace of his imagination. As an author, Sheil was also eminently distinguished. He wrote some successful tragedies; one of them, "Evadne," still retains possession of the stage. When the emancipation act passed, Sheil was elected member for Milbourne Port, and, in spite of his shrill voice and vehement gesticulation, his fervid eloquence placed him at once in the foremost rank of the most attractive speakers in the House. When O'Connell's energies declined, many in Ireland looked on Sheil as his successor; but the orator had too closely allied himself with the Whig party, and for some years was heard in the House but on rare occasions. Besides being a queen's counsel and a privy-councilor, Sheil was successively a commissioner of Greenwich Hospital, vice-president of the Board of Trade, Judge Advocate-General, and Master of the Mint. His last appointment was that of minister plenipotentiary at Florence, Italy, where he died May 25, 1851.

Shekel, in Hebrew weights, the fundamental weight in the Hebrew scale. It is believed to have weighed 8.78 drachms avoirdupois, 10 pennyweights troy. Half a shekel was called a bekah, which was divided into ten gerahs. Three hundred shekels constituted a talent. In Hebrew money, a coin believed to have been worth 54.74 cents, but money was then, perhaps, 10 times as valuable as now. Shekels of the Maccabee period still exist. In shekels of three years, struck under Simon Maccabæus, the obverse has a vase, over which are the Hebrew letters aleph, shin with a beth, and shin with a gimel; the reverse, a twig with three buds and an inscription, Jerusalem Kedushah, or Hakedushah (Jerusalem the Holy). The character is the Samaritan. Other so-called shekels in the square Hebrew letters are considered forgeries.

Shelburne, William Petty, Earl of, son of the 1st earl, and maternal grandson of the famous Sir William Petty; born in Dublin, May 20, 1737. After studying at Oxford and serving in Germany, he entered the House of Commons for the borough of Wycombe in 1761, but only sat for a few weeks, the death of his father calling him to the House of Lords. When George Grenville succeeded Bute in 1763 Lord Shelburne was placed at the head of the Board of Trade, and when Chatham formed his second administration in 1766 he became one of the Secretaries of State. On the fall of Lord North's ministry in 1782 George III. sent for Shelburne and proposed to him to form a government. He declined, not being the head of a party, and was sent by the king to the Marquis of Rockingham with an offer of the Treasury, himself to be one of the Secretaries of State. It soon ap-

peared that Shelburne was not so much the colleague as the rival of Lord Rockingham, the chosen minister of the court, and the head of a separate party in the cabinet.

On Rockingham's death in the following July the king sent at once for Shelburne and offered him the Treasury, which he accepted without consulting his colleagues. Fox thereupon resigned, and Shelburne introduced William Pitt, then only 23, into office as his Chancellor of the Exchequer. Shelburne's ministry, on the occasion of the king's announcement of his determination to concede the independence of the American colonies, found itself outvoted by the coalition between Fox and Lord North (February, 1783). He resigned, and the coalition ministry took his place, but soon broke up. The nation expected that the king on this event would have sent for Shelburne, but William Pitt received the prize, and Shelburne was consoled by being made in 1784 Marquis of Lansdowne. The rest of his days he spent in retirement, amusing himself by collecting in Lansdowne House a splendid gallery of pictures and a fine library, and with the friendship of Priestley, Jeremy Bentham, Sir S. Romilly, Mirabeau, Dumont, and others. He died in Bowood Park, Wiltshire, May 7, 1805.

Shelby, Isaac, an American military officer; born in North Mountain, Md., Dec. 11, 1750; settled with his father on the site of Bristol, Tenn., in 1771, and there engaged in the herding of cattle. In 1774 he was made a lieutenant in a company commanded by his father. He was present at the action of Point Pleasant, where his skill won the day, and he commanded the fort there till July 1775. During the battle of Long Island flats, when the American line was broken by the attack of the Indians, though present only as a private, he took command, and by his valor so inspirited the troops that they rallied and completely defeated the savages. Along with the defense of Watauga this victory saved the colonies in the South from a rear attack. Later Shelby was appointed commissary-general of the Virginia troops with the rank of captain; was made colonel in 1779; and in the following year with John Sevier planned the expedition which brought about the action of King's Mountain and changed the whole aspect of the Revolutionary War. In 1792, when Kentucky became a State he was chosen its first governor by an overwhelming majority. He refused to be a candidate for a second term, but settled down to farm life which he declined to leave for public office. When the War of 1812 broke out and Michigan fell into the hands of the enemy, though 63 years old, he recruited and led 4,000 men to reënforce Gen. William H. Harrison. In recognition of this service Congress voted him a gold medal and he received the thanks of both that body and the Legislature of Kentucky. He died near Stanford, Ky., July 18, 1826.

Shelbyville, a city and county-seat of Shelby co., Ind.; on the Big Blue river, and on the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Cleveland, Cincinnati, Chicago, and St. Louis railroads; 26 miles S. E. of Indianapolis. It is in a rich agricultural section, and has a large general trade, flour, saw and planing mills, and manufactories of barrels, ice, carriages, and furniture. Pop. (1890) 5,451; (1900) 7,169; (1910) 9,500.

Shelbyville, a town and county-seat of Bedford co., Tenn.; on the Duck river, and on the Nashville, Chattanooga, and St. Louis railroad. Here are the Shelbyville Female College, National and State banks, and weekly newspapers. The town has a large trade in grain and mules, an extensive lead pencil factory, foundries, machine shops, and lumber yards, flour, planing, saw, cotton, and woolen mills. It is also a notable shipping point of pencil cedar and telegraph poles. During the Civil War important military operations were carried on in the town and vicinity. Pop. (1890) 1,823; (1900) 2,236.

Sheldon, Charles Monroe, an American clergyman; born in Wellsville, N. Y., Feb. 26, 1857; was graduated at Brown University in 1883 and at Andover Theological Seminary in 1886; was ordained in the Congregational Church the same year, and became pastor of the Central Congregational Church, Topeka, Kan., in 1899. He edited the Topeka "Capital" for one week in 1900, as a distinctly Christian newspaper, and was the author of numerous books including "His Brother's Keeper," "In His Steps," "Malcom Kirk," "Edward Blake," "Born to Serve," etc.

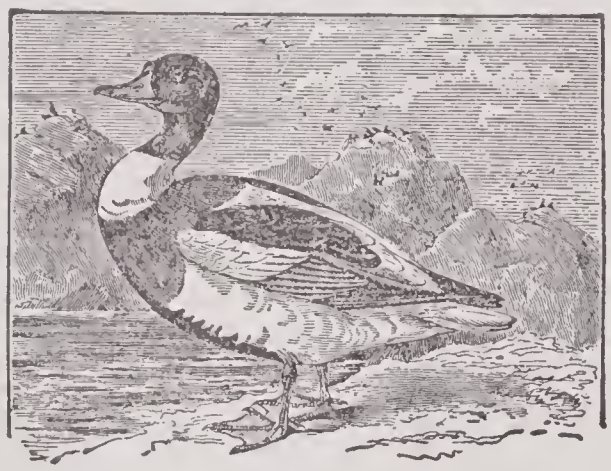
Sheldon, Grace Carew, an American journalist; born in Buffalo, N. Y.; was graduated at Wells College in 1875. She founded and became the head of the Woman's Exchange of Buffalo in May, 1886. This exchange receives work only from self-supporting women in the United States. She also instituted talks on Scott and his novels in Buffalo and other cities. In September, 1895, she went to the International Press Congress held in Bordeaux as the first American woman delegate. Later she traveled in Northern Venezuela, Orinoco, Curacao, Haiti, and the West Indies, for the purpose of contributing special articles to New York and Buffalo papers. Her publications include "As we Saw it in '90" (1891); "From Pluckemin to Paris"; etc.

Sheldon, George William, an American author; born in Summerville, S. C., Jan. 28, 1843; was graduated at Princeton College in 1863; was an instructor of Latin

and belles-lettres there in 1865–1867; and was tutor of Oriental languages at Union Theological Seminary in 1867–1873. He then became an art critic and journalist in New York city, and later went to Europe to represent D. Appleton & Co. His publications include "American Painters"; "Hours with Art and Artists"; "Story of the Volunteer Fire Department of New York City"; "Artistic Homes"; "Selections in Modern Art"; "Ideals of Life in France"; "Artistic Country Seats"; etc.

Sheldon, Lionel Allen, an American military officer; born in Otsego co., N. Y., Aug. 30, 1829; received a common school education; was admitted to the bar in 1851; and began practice in Elyria, O. In 1856 he was a delegate to the Philadelphia Republican Convention and there supported John C. Fremont as its nominee for President. In 1860 he was commissioned a Brigadier-General of militia, and in that capacity raised many recruits for the Union army. He was made colonel of the 42d Ohio Infantry in 1862; commanded that regiment in Kentucky, West Virginia, and Eastern Tennessee; won distinction in the battles of Chickasaw Bayou and Arkansas Post; was wounded in the action at Fort Gibson; and took part in the capture of Vicksburg. He was brevetted Brigadier-General of volunteers in 1865. After the war he removed to New Orleans, where he practised law; was a Republican member of Congress in 1869–1875; and governor of New Mexico in 1881–1885.

Sheldrake, in ornithology, the *Tadorna cornuta* (or *vulpanser*) of modern ornithologists; *Anas tadorna*. It is somewhat



COMMON SHELDRAKE.

larger than an ordinary duck, with a fleshy protuberance at the base of the bill, whence its specific name. It is a very handsome bird; head and upper neck dark, glossy green, broad white collar, below which a broader band of bright bay extends from the back across the breast; outer scapulars, primaries, a median abdominal stripe, and a bar on tip of middle tail quills black; inner secondaries and lower tail coverts gray; speculum rich bronze green; rest of plumage white. The female is smaller and less brilliantly colored. It frequents sandy coasts in Europe and North Africa, ranging across Asia to Japan; nesting under cover, usually in a rabbit hole. The ruddy sheldrake, *T. casarca*, is a native of Barbary, Southeastern Europe, and Central Asia. Its color is an almost uniform bay, the male with a black ring round the neck. The common sheldrake breeds freely in captivity, crossing readily with other species, and the offspring show a remarkable tendency to reversion.

Shell, in zoölogy, the hard calcareous substance which either protects the testaceous mollusca externally, or supports certain species of them internally. Though shells, properly so called, which form the habitation of testaceous animals are sometimes confounded with the shelly coverings which protect the crustacea (crabs and their numerous allies), a very obvious and striking difference exists between them, as well as between the kinds of animals which respectively inhabit them. The shells of testacea are composed of carbonate of lime, combined with a small portion of gelatinous matter; they are, in general, permanent coverings for their inhabitants; and the animal is of a soft substance, without bones of any kind, and attached to its domicile by a certain adhesive property. On the other hand, those animals which are defended by a crustaceous covering cast their shells and renew them annually; while the animals themselves are of a fibrous texture, with articulated limbs, and protected, as it were, by a coat of mail.

Shells are divided into Multivalves, Bivalves, and Univalves. The first order, Multivalve, is made up of shells consisting of more shelly parts or pieces than two. Every part of a shell which is connected with a corresponding part by a cartilage, ligament, hinge, or tooth, is called a valve of such shell. The second order, Bivalve, is made up of shells having two parts or valves, generally connected by cartilage or hinge; as in the cockle and mussel. The third order, Univalve, is made up of shells complete in one piece — as in the periwinkle and the whelk — and they are subdivided into shells with a regular spire, and those without a spire. The shells composing this order are far more numerous than those of the two preceding, both in genera and species. The spire is a prominent feature of the Univalve; and on its being lengthened or elevated, shortened or depressed, etc., depends much of the generic and specific definitions. Shells increase in size by the deposition of new layers internally on those already formed. Each new layer extends more or less beyond the margin of the layer to which it is applied, so that as the animal becomes older its

Shell

shell becomes larger and thicker. The outer surface is generally covered by a thin layer of membranous or horny matter, named the epidermis, and the inner surface is often covered with a layer of a pearly nature. It is universally found that the marine shells of warm climates exceed all others in beauty of coloring and in taking a fine polish. Several of the land shells, also, that are met with in tropical countries are remarkable for their bright colors and elegant forms. River and land shells, with very few exceptions, are thinner than those of the sea.

In military usage the name shell is given to a hollow vessel of metal containing gunpowder, or other explosive compound, so arranged that it shall explode at a certain point and spread destruction around by the forcible dispersion of its fragments. The invention of this missile, formerly called a BOMB (*q. v.*), cannot be accurately traced. Shells were employed in A. D. 1480 by the Sultan of Gujerat, and by the Turks at the siege of Rhodes in 1522. The Spaniards and Dutch both used them during the war of Dutch independence; and they appear to have been generally adopted by about 1634. Formerly every shell was a hollow sphere of cast iron, varying in thickness from half an inch to two inches, and in diameter from 5½ to 13 inches. The sphere had a fusehole (like a bunghole) an inch across, through which the charge was inserted, consisting of pieces of metal and powder to burst the shell. The hole was plugged by a fuse, which was a tube of slow-burning powder timed to communicate fire to the charge after the lapse of a certain number of seconds. This fuse might either be kindled by hand the moment before the mortar was fired, or its ignition might be effected by the act of firing itself. Since the introduction of rifled ordnance, the shell has become the commonest form of projectile. It has ceased to be spherical, and is usually of cylindrical form and pointed at the end. Having a polar movement, so that the conical end always strikes first, they are adapted for percussion priming, which placed in this end explodes as the projectile reaches the obejct against which it is thrown (see PROJECTILES: SHOT). The term shell is given to an engraved copper cylinder employed in print works.

Shell, Its Industrial Uses. It may surprise some to learn that shells rank among the principal "fishery" products of the world. This refers to those used for industrial purposes and not to the large supplies for museum and cabinet collections. In London the sales of pearl shells or mother-of-pearl, amount to about $4,000,000 each year, and the annual imports of this material into the United States exceed $1,000,000 in value. The shells caught in this country aggregate about 1,000,000 tons annually. The economic utilization of these is more diversified than is generally supposed, giving employment to many thousands of persons and constantly increasing in importance. The most valuable item in shell production is mother-of-pearl. The most important is the pearl oyster found in many inshore tropical waters of both continents. The shells vary greatly in color and iridescence, but three general classes are recognized, viz.: white or silver-lipped, yellow or golden-edged, and smoky or black-edged; the last yielding the so-called "smoked" mother-of-pearl.

The white shell has the silvery lining uniform over the surface, and as it may be cut up to greater advantage, it is the most valuable. When black pearl buttons are fashionable, the black-edged shell sells almost as high as the best white shell. A fair valuation of mother-of-pearl shells is $400 per ton, though the choicest sell for upward of $1,500 per ton.

During the last 10 years large quantities of low-grade pearl shell have been secured from the fresh-water mussels of the United States. These occur principally in the Mississippi river from Prairie du Chien, Wis., to Quincy, Ill., and to a much less extent in adjoining waters. Though their utilization originated so recently as 1891, the present annual product is very large, exceeding 20,000 tons during certain years. The value is much less than that of choice pearl shell, selling usually for less than $25 per ton.

Many univalve shells are sufficiently nacreous and iridescent to be used as mother-of-pearl, especially abalones, top shells, "green snail" shells, etc. In variety and intensity of coloring the pearly lamina of some of these exceeds that of the pearl oyster. However, the coloring is not so harmonious nor is the shell so thick and flat as in the pearl oyster, consequently they are not desirable for many purposes for which the latter are employed.

Mother-of-pearl is used in the manufacture of a great variety of articles for which it is peculiarly adapted by reason of its hardness and beauty. Most important of these are buttons, knife handles, parasol handles, buckles, penholders, pistol stocks, etc. It is also used for inlaying and for covering opera glasses, card cases, etc. In the aggregate a very large number of persons are given employment in working up this material. Formerly the business was centered at Birmingham, England, and Vienna, Austria, 4,000 persons being thus employed at the former place a few years ago; but it has gradually extended to other localities, especially in France and the United States. It is claimed that about 8,000 persons are employed in working pearl shell in Austria,

Shell

5,000 in England, 4,000 in France, 3,500 in America, and many in various other countries. The manufacture of pearl buttons in this country from domestic shells dates from 1891 and is already of very great extent, the 60 factories giving employment to about 2,500 persons and using 12,000 tons of shells annually, yielding about 600,000,000 buttons.

Pearl shell is much used for inlaying, especially of musical instruments, jewelry boxes, domestic furniture, church vestments, etc. Artistic work of this nature is done in the United States as well as in Europe and Asia. The shell is cut in simple patterns and is also used in floral and in arabesque designs. For this purpose the brilliantly colored abalone shell is used with beautiful effect, especially when combined with white shell. Some very elaborate work of this nature is done. A mandolin recently exhibited in this country contained more than 2,000 pieces of four different kinds of shell, and 225 days' work were expended in cutting and finishing the pieces, the whole representing an investment of $1,500. Some years ago there was exhibited in New York city a piano, the entire keyboard of which was of pearl. The body of the keys was of ordinary white shell and the flats and sharps were of green abalone, the effect being extremely rich and pleasing.

The most abundant shells in America are those of oysters and clams, especially the former. The product of these approximates 30,000,000 bushels annually and the purposes to which they are applied are numerous. The most important use is in road-making. At various points on the Atlantic seaboard, and particularly in the Chesapeake and the Delaware bay regions, many miles of good roads have been made of this material. It is estimated that 3,000 miles of roads on the Atlantic coast have been surfaced with shells. Connecticut, Long Island, the Delaware bay side of New Jersey, Delaware, Maryland, Virginia, North Carolina and Louisiana contain many excellent examples of oyster shell roads. To cover a road 16 feet wide to a depth of 15 inches in the middle and 8 inches at the sides requires about 30,000 bushels of shells per mile, costing on an average of three cents per bushel, or a total of $900 per mile. To keep such a road in good repair requires about 2,500 bushels of shells per mile annually at a cost of about $75. Though they constitute the cheapest and most convenient material in the sections where they are commonly used, shells are not wholly satisfactory for road material owing to their rapid wear and the spreading of objectionable lime dust.

Oyster shells are largely employed as ballast for beds of railroads. While not nearly so durable or steady as rock, they answer the purpose fairly well and are the most convenient and economical material in many localities. Examples of their use for this purpose occur on many of the railroads in Maryland, Virginia, and Louisiana.

Oyster shells have been extensively used as a source of lime, especially for agricultural purposes, as well as in masonry. Most of the brick buildings erected in colonial times were solidified with shell lime. Owing to its tendency to absorb moisture and thus make the houses damp its use for this purpose was abandoned soon after the discovery of limestone in abundance. The quantity of burned oyster shells spread on farming lands amounts to many thousands of tons annually. These shells are also crushed into small particles and fed to chickens to improve their digestion and their egg laying. This use is increasing in popularity. Oyster shells are also employed in the manufacture of certain special grades of steel owing to their large content of carbon.

A somewhat recent use for shells in America is for spreading on private oyster grounds for the purpose of obtaining a "set" of young oysters. When the extremely small oysters hatch from the floating eggs and sink to the bottom it is important that they find a clean substance for attachment, otherwise they are readily smothered. It is estimated that 4,000,000 bushels of oyster shells are used annually for this purpose, mostly in the waters of New York, Connecticut, and Virginia. They are spread immediately before the spawning season, usually in June in the Chesapeake region and in July in Long Island Sound.

Several other varieties of shells are used for "spat collecting," especially "jingles" (*Anomia ophippium*), "quarterdecks" (*Crepidula fornicata*) and scallops (*Pecten irradians*). These are obtained mostly from Peconic bay at the E. end of Long Island where several hundred thousand bushels of mixed shells are dredged annually to be marketed in the oyster planting regions of New York and Connecticut. They are considered superior to oyster shells for "clutch," owing to the fact that they are smaller and only a few young oysters "set" on each, thus avoiding the crowding which occurs when large shells are used. Another reason for their preference is that they are easily broken and disintegrated and so do not encumber the ground after serving as "spat collectors."

Large quantities of shells are used for ornamental purposes. Especially prominent among these are the abalone or ear shells obtained from California, Japan and various other countries. About 500 tons of abalone shells are gathered annually on the Pacific coast of America, worth about $40,000. This product however is only one-

Shell

fourth or one-third as large as it was 20 years ago. When cleaned and polished the highly iridescent green, red and pearly white colors are exquisite and make these shells beautifully ornamental. Much skill is exercised in polishing in order to produce the best effects. Some of the abalone shells are of such shape and coloring that it is possible in grinding to produce a perfect cross of black against a pearly white background; these meet with ready sale, the purchasers usually assuming that the cross appeared on the shell in nature.

The large green conch or fountain shell obtained on the Florida coast, the West Indies, etc., is much used for ornament. The graceful curves and the delicate tints of lovely pink color make it one of the most attractive of all shells. It is much used in making brooches, earrings, etc., and in the form of beads in imitation of pink coral and pink pearls. Large quantities of conches have been pulverized and used in porcelain manufacture.

The pectens or scallop shells have long been admired owing to their beauty of form. During the Middle Ages pilgrims ornamented their clothing with them, as an indication, doubtless, of having crossed the sea to the Holy Shrine in Palestine, and for this reason they were known as "pilgrim shells." To commemorate that event they were preserved in the heraldic devices of many families whose ancestors had performed that journey. Scallop shells were formerly much used by cooks for holding foods, hence the name "scalloped oysters."

The popularity of shells for personal ornamentation has resulted in their use as currency or standard of value among many primitive peoples. A well-known example of this is the wampum of the North American aborigines, made from the quahog or hard clam shell, so numerous on the Atlantic coast. Somewhat less extensive was the use of the tooth shell or *Dentalium* on the N. W. coast, and of the abalone on the California coast. Even at the present time in many parts of Africa and to a less extent in British India species of the cowry family are used as currency. In some seasons 8 or 10 vessels carry cargoes of the money cowry (*Cyprea moneta*) to the W. coast of Africa, where they are exchanged for palm oil and other products.

The window-glass shell (*Placuna placenta*), found in the Pacific and Indian oceans, and especially among the Philippine Islands has an almost flat bivalve shell, six or eight inches in length. The inside of this shell is glazed over and has a subdued pearly luster. It is so thin and transparent that print can be read through it, and it is used as a substitute for glass in windows, admitting a soft, mellow light into the room. It is commonly used in the Philippines in windows of residences, etc.

The giant clam (*Tridacna*) yields the largest and heaviest shells in existence, single pairs weighing over 500 pounds in some instances. These are much used for ornaments, especially for fountain basins and for benetiers or holy-water fonts. They are found in many tropical waters, and especially on the pearling grounds. Divers inadvertently placing a hand or a foot in the open shell are held imprisoned, and it is necessary for the unfortunate man to at once cut off the limb in order to save his life. In case both hands are imprisoned, as in head diving, escape is impossible without assistance, which usually arrives too late. A beautiful pair of these shells are used as benetiers in the Church of St. Sulpice in Paris. This pair is said to have been a gift of the republic of Venice to Francis I.

The most artistic use of shells is in the formation of cameos, which are cut from univalve shells made up of laminæ of different colors. The middle lamina, which is usually white, forms the body of the figure in bas-relief, and the dark inner layer forms the ground. The outer or superficial layer is entirely removed, or it may be used to give a varied appearance to the surface of the design.

Of the several varieties of shells employed in cameo cutting, the black helmet (*Cassis tuberosa*) is the most valuable. This occurs in the West Indies and to a less extent on the American coast S. of Cape Hatteras. It has a blackish inner coat and the cameo cut from it shows white upon an onyx ground varying from dark claret to much lighter shades, producing effective results. This shell is ordinarily 12 inches in length, and usually five brooches of average size and several smaller articles may be cut from each one. The bull's mouth (*C. rufa*) is also popular; it has a red inner coat and a sardonyx ground. The horned helmet (*C. cornuta*) gives white upon an orange yellow background. The laminæ of this shell are apt to separate, making it disagreeable to work. The queen conch is also used to a considerable extent; the ground color is brilliant pink, which is somewhat evanescent on exposure to light. An attractive method of using this shell is to incise the bas-relief in the pink layer, using the white as the background, thus reversing the usual method.

Shell cameo figures consist of copies of antiques, original designs, and portraits. Sometimes an entire shell — especially of the black helmet variety — is used, and either a small figure is cut on the face of the shell or the entire surface is covered. In the latter case the principal design is in the center and around it are such minor designs as the fancy of the artist dictates. Some of these sell very high, and hundreds and even thousands of dollars are secured for a single carved shell. One exhibited in

this country by a Naples artist represented two years' work.

The real value of a cameo consists in purity of material, beauty of design and delicacy of workmanship. As an art, shell cameo cutting has become much degraded, having fallen under the deteriorating influences of low-priced productions. Most of the cutters at present are merely skilled workmen and not artists, and the bulk of the output consists of cheap productions quite inferior to those of half a century ago. For this reason the fashion for them has greatly declined. However, there are yet several shell cameo workers who compete with sculptors in artistic productions.

CHARLES H. STEVENSON.

Shelley, Mary (Godwin), an English author, second wife of the poet Shelley; born in London, Aug. 30, 1797. Her first story, "Frankenstein" (1818), won for her a place among the imaginative writers of England; it was followed by "Valperga," a historical romance (1823); "The Last Man" (1826); "Lodore" (1835); "Falkner" (1837). She died in London, Feb. 21, 1851.

Shelley, Percy Bysshe, an English poet, son of Sir Timothy Shelley; born in Horsham, England, Aug. 4, 1792; was educated at Sion House School, Brentford, at Eton, and at University College, Oxford. Of a delicate constitution he was early characterized by an extreme sensibility and a lively imagination, and by a resolute resistance to authority, custom, and every form of what he considered tyranny. At Eton he put himself in opposition to the constituted authorities by refusing to submit to fagging. At Oxford he published anonymously, a scholastic thesis entitled "A Defense of Atheism." The authorship being known he was challenged, and refusing either to acknowledge or deny it, was at once expelled. After leaving the university, he completed his poem of "Queen Mab," begun some time previously, and privately printed in 1813. His first great poem, "Alastor, or the Spirit of Solitude," (1816), was followed in 1817 by the "Revolt of Islam," a poem in the Spenserian stanza. In September, 1811, six months after his expulsion, he eloped to Edinburgh with Harriet Westbrook, the daughter of a retired innkeeper. She was 16 years of age, his own age being 19. The marriage turned out unhappily, and after nearly three years of a wandering unsettled life Mrs. Shelley returned with two children to her father's house. In November, 1816, she committed suicide by drowning. Shelley was deeply affected by this event, but soon after married Mary Godwin, with whom he had visited the Continent in 1814, and by whom he already had a child. By a suit in Chancery decided in 1817, Mr. Westbrook obtained the guardianship of the children, on the plea that his atheistical opinions and irregular views on marriage made the father unfit to be intrusted with them. Partly from his lungs being affected, and partly from anxiety lest he should be deprived of the children of his second marriage, Shelley left England in March, 1818, and the whole short remainder of his life was passed in Italy. After staying for some time with Lord Byron at Venice he proceeded to Naples; after Naples he visited Rome; and from Rome he went to Florence and Leghorn, and finally settled at Pisa. On July 8, 1821, he was sailing with a Mr. Williams in the Bay of Spezia when both were drowned by, as was long believed, the upsetting of the boat through a sudden squall; but there is some suspicion that the boat was purposely run down by an Italian feluca for the sake of plunder.

Shelta, or **Shelru,** a secret jargon of great antiquity spoken by Irish tinkers, beggars, and pipers, the descendants of the ancient ceards and bards. The word Shelrū is a perversion of the the Irish *bélura*, "language." Shelta is otherwise known as "Cainnt cheard," "Minkur-tharal," "Gam (or Gamoch) cant," "Bog-latin," and Béarl' eagair." For use of last name see "Gaelic Dictionary of the Highland Society" (1828), i: 113: "Beurl' eagair." For "Laidionn nan ceard," the gibberish of tinkers: *figulorum stribligo; dialectus qua utuntur ollarum sartores circumforanei"*; also i: 548: "Gibberish: *mendicorum et nebulonum ex compacto sermo, barbaries.*" Béarla eagair (*i. e.*, "vernacular") thus used must not be confounded with Béarlagair na saor (mason's jargon) a few words of which are given by MacElligott ("Dublin Gaelic Society," 1808). The earliest specimens of this idiom, collected (1877–1889) by Charles G. Leland from an English vagrant in North Wales and an Irish tinker in Philadelphia, are published in "The Gypsies," pp. 354–372. The investigation of Shelta was continued by D. MacRitchie in the "Journal of the Gypsy Lore Society" (i: 350–357), where fresh examples from the Scotch Highlands and South Ireland subsequently appeared. In the same "Journal" (ii: 204–220) the writer showed Shelta to be a systematic perversion of the preaspirated Gaelic spoken anterior to the 11th century, and Dr. Kuno Meyer (ii: 257–266) in an erudite paper on "The Irish Origin and Antiquity of Shelta," adduced numerous references to this jargon in early Irish MSS.

Shelta has been identified by Dr. Meyer with the ancient secret language called Ogam, a word probably surviving in the name Gam or Gamoch cant. References to Ogam as a spoken tongue occur in the "Annals of Clonmacnoise" (1328) and in O'Molloy, "Grammatica" (1677), p. 133.

Several common Shelta words are found in the "Dúil Laithne" or "Book of Latin," an Ogam glossary copied by MacFirbis from an old or middle Irish MS. Professor Thurneysen ("Revue Celtique," vii: 369–375) has shown that many of these Ogam words are formed by substituting for the initial its runic name: thus *manaith* is formed from Ir. *maith* by changing *M* into *muin*, the name of the letter; Shelta *nadherum*, "mother," being similarly an anagram of *muinathair* (Irish *mathair*). Shelta words are also fabricated from Irish by reversing or transposing the letters of the original word (*e. g.*, *grē*, "rise," Irish *érg; tober*, "road," Irish *bothar*), by changing the initial (*e. g.*, *jŭmnik*, "Sunday," Irish *domnach*), and by the prefix, suffix, or interpolation of arbitrary letters to the Irish word or its anagram (*e. g.*, *gladher*, "skin," Irish *leathar; thalosk*, "day," Irish *latha; srijo*, "king," Irish *rig; laskon*, "salt," Irish *salann*). Analogous modes of word disguise are described in the "Amra Choluimchille," an Irish MS. of the 12th century, and in the "Uraicept na n-Eges" ("Primer of the Poets"), each of these processes having a recognized name. A few old Irish words are used in Shelta with disguise, as *kūnya*, "priest," Irish *cairncach*, "druidical priest"; *gyukera*, "beggar," Irish *gcocaire*. Shelta borrows its grammar and unimportant words from Irish or English. The tinkers believe Shelta to be an independent language of Pictish origin.

Shenandoah, a river of the United States, which flows N. E. through the valley of Virginia, and immediately below Harper's Ferry joins the Potomac, of which it is the principal tributary. Its length is 170 miles, the greater part of which is navigable for boats. The valley of the Shenandoah was the scene of numerous military operations in the American Civil War, and was devastated by General Sheridan in 1864.

Shenandoah, a borough in Schuylkill co., Pa.; on the Philadelphia and Reading, the Lehigh Valley, and the Pennsylvania railroads; 13 miles N. of Pottsville. Here are a number of the largest coal mines in the rich anthracite coal section of which it is the center. It also contains a high school, street railroad and electric light plants, public library, building and loan associations, National and other banks, a daily and several weekly newspapers. It has hat factories, a brewery, and other industries, and an assessed property valuation of about $2,500,000. Pop. (1890) 15,944; (1900) 20,321; (1910) 25,774.

Shenandoah, The, a ship in the Confederate service during the American Civil War. It was built at Glasgow in 1863 for the China trade, and in 1864 was purchased by the Confederates. Her war record included the capture of 38 Federal vessels. Lieut. J. I. Waddell was in command from 1864 to 1865, while the Shenandoah was a privateer. On Oct. 19, 1864, the vessel was commissioned and ordered on a Pacific cruise. Before reaching Melbourne she made nine captures. From Australia she sailed N., and in the whaling regions did much destruction among the New England whaling fleets. This career was continued for several months after Lee's surrender, and included the last hostile acts of the Civil War. When Commander Waddell learned of the close of the war, he sailed to Liverpool and surrendered to the British government. The commander and crew were liberated and the ship was handed over to the United States consul. The Shenandoah was the only vessel that carried the Confederate flag around the world.

Shenandoah Mountains, a range of the Alleghenies forming the W. boundary of the Shenandoah valley in Virginia.

Shenandoah Valley, a valley in Virginia; between the Blue Ridge on the E. and the Shenandoah Mountains on the W. It is noted for its beautiful scenery, hilly and broken, with intervening fertile slopes and extents of high rolling land. It has large forests of various kinds of trees, including oak, chestnut, and hickory. The entire valley is of great historic interest, having been the arena of thrilling events in the American Civil War, including "Stonewall" Jackson's campaign in 1862, and that conducted by Sheridan in 1864.

Shenango, a river in the N. W. part of Pennsylvania, joining the Mahoning near New Castle, the two rivers forming the Beaver. It is about 90 miles long.

Sheng=King, or **Liao Tung,** a province in Manchuria; nominally belonging to China, but believed (1904) to be dominated by Russia, stretching into the Yellow Sea between the gulf of Liao Tung and Korea bay; has an area of 37,000 square miles and a pleasant climate, and is generally fertile. The S. portion of the province, known as the Liao Tung Peninsula, at the extremity of which is the famous Port Arthur, was ceded to Japan after the war of 1895; was retroceded to China under pressure; and was ceded to Russia in 1898. Pop. 6,000,000.

Shenshin Afanasy Afanasievitch. See FET, A.

Shen=si, a province of China; bounded on the N. by Mongolia, on the E. by the Hwang-ho and Honan, on the S. by Hupeh and Sze-chuen, and on the W. by Kansuh; area, 75,270 square miles. It is chiefly an agricultural province, but contains very extensive coal fields, both anthracite and bituminous, and abundant deposits of iron ore. A British syndicate has obtained a concession for working the Shen-si mines. In 1901 the famine in Shen-si was so severe that cannibalism was resorted to and it

was estimated that 30 per cent. of the population died. From Si-ngan-foo, the provincial capital, and anciently the capital of the empire, radiate a number of roads going E., S., and W., and Shen-si is thus the great channel of communication between China and Central Asia. Wheat is the chief staple, though barley, pulse, millet, maize, ground-nuts, poppy, hemp, tobacco, and cotton are extensively raised. Pop. (1902) 8,450,182.

Shenstone, William, an English poet; born at the Leasowes, near Halesowen, England, in November, 1714. His best-remembered poems are: "The Schoolmistress" (1742); "The Pastoral Ballad" (1743); and "Written in an Inn at Henley." His "Works" and "Letters" were collected in three volumes (1764–1769); and his "Essays on Men and Manners" were republished in 1868. He died near Halesowen, Feb. 11, 1763.

WILLIAM SHENSTONE.

Sheol, in Jewish belief, the place of the dead, from a Hebrew word meaning a cave. In the Authorized Version of the Bible it is translated by the words, hell, grave, or pit. In the Revised Version the word "sheol" is generally left untranslated in the text, while "grave" is put in the margin. For instance, in Ps. ix: 17, "The wicked shall be turned into hell" (Authorized Version), becomes, "The wicked shall return to sheol" (Revised Version). See HELL.

Shepard, Charles Upham, an American mineralogist; born in Little Compton, R. I., June 29, 1804; was graduated at Amherst College in 1824; then pursued special studies in mineralogy and botany in Cambridge, Mass.; was lecturer on natural history at Yale University in 1830–1847; and Professor of Chemistry at the Medical College of South Carolina in 1834–1861. Owing to the outbreak of the Civil War he resigned his chair in the latter institution, but in 1865 was urged to return, which he did for a few years. In 1835 he discovered a new species of microlite; in 1838 that of warwickite; and in 1839 that of danburite. During his residence in Charleston, S. C., he discovered valuable deposits of phosphate of lime near that city, which proved very useful in the manufacture of fertilizers and added greatly to the chemical industries of the State. His publications include: "Treatise on Mineralogy" (1855); "Report on the Geological Survey of Connecticut" (1837); etc. He died in Charleston, S. C., May 1, 1886.

Shepherd Kings, the chiefs of a nomadic tribe of Arabs, who established themselves in Lower Egypt some 2,000 years B. C. Manetho says they reigned 511 years, Eratosthenes says 470 years, Africanus, 284 years, Eusebius, 103 years. Some say they extended over five dynasties, some over three, some limit their sway to one; some give the name of only one monarch, some of four, and others of six. Bunsen places them 1639 B. C.; Lepsius, 1842 B. C.; others, 1900 or 2000 B. C.

Shepherd's Dog, a popular name for many varieties of *Canis familaris,* used to tend and drive sheep. The English shepherd's dog has a longish head, with a sharp muzzle, and good breadth over the forehead; his ears are slightly raised, and his coat is short and wooly; tail usually long and bushy; he is less faithful and sagacious than the collie. The drover's dog is larger and stronger, and has usually a strain of mastiff blood. Special breeds of sheep dogs are found on the European Continent.

Shepherd's Purse (*Capsella bursa pastoris*), a plant of the natural order *Cruciferæ.* It is an annual weed, found in all temperate climates, having simple or cut leaves and small white flowers. It is found everywhere, in fields, pastures and roadsides.

SHEPHERD'S PURSE.

Sheppard, Elizabeth Sara, an English novelist; born in Blackheath, England, about 1830. She wrote the noted "Charles Auchester" (1853), a mystical art novel; "Counterparts, or the Cross of Love" (1854); "My First Season" (1855); "The Double Coronet" (1856); "Rumor," a musical and artistic novel (1858). She died in Brixton, March 13, 1862.

Sherbrooke, Robert Lowe, Viscount, an English statesman; born in Bingham, England, Dec. 4, 1811; was educated at Win-

chester and Oxford. Called to the bar in 1836, he went to Australia in 1842, practised in Sydney; took a leading part in politics and became a member for Sydney. At home again in 1850, and returned in 1852 as a member of Parliament, he in 1853 took office under Lord Aberdeen, and in 1855 under Lord Palmerston. During 1859-1864 he was vice-president of the Education Board, and introduced the Revised Code of 1860, with its principle of "payment by results." He opposed the Whig Reform Bill in 1866. In 1868 he aided the Liberal leaders in carrying the disestablishment of the Irish Church. He obtained in Mr. Gladstone's ministry the office of Chancellor of the Exchequer; exchanging it in 1873 for that of Home Secretary. In education he opposed the once exclusive study of the classics. In 1880 he went to the Upper House as Viscount Sherbrooke. He wrote "Poems of a Life" (1884). He died in London, England, July 27, 1892.

Sherbrooke, a city of Quebec, Canada, the county-seat of Sherbrooke co.; attractively situated at the junction of the St. Francis and Magog rivers, and on the Grand Trunk, Canadian Pacific, Boston and Maine, and Quebec Central railways, 85 miles E. by S. of Montreal in a direct line, and 101 miles by rail. It is the terminus of the Boston and Maine and the Quebec Central railways, and the chief place in the Eastern Townships, or English portion of the province. The principal business streets are Wellington and King, and the principal residential strects are Dufferin and Bowen avenues, and Queen, London, Quebec, Montreal, Melbourne, and Ball streets. The most noteworthy buildings are the post office, court house, St. Charles College, Art and Public Library building, Young Men's Christian Association building, and the buildings of the Sun Life and the Mutual insurance companies and the Eastern Township Bank. The leading parks and places of scenic interest are Victoria and Racine parks, the Parade Grounds, and Strathcona and Portland squares. Sherbrooke, which is the seat of a Roman Catholic bishop, has 3 Roman Catholic churches (including the cathedral), 2 Anglican, 1 Methodist, 1 Congregational, 1 Presbyterian, and 1 Baptist church. The educational and charitable institutions include St. Charles College, Notre Dame Convent, the public library, Monument National, Protestant, and Roman Catholic hospitals. There are a theater, 1 daily newspaper, 1 semi-weekly (published in French), and 1 weekly. The surrounding district is rich in agricultural products, and about 50 miles from the city are the famous asbestos mines which furnish the largest part of the world's supply of that mineral. Copper, iron, gold, and silver also occur. The city has splendid water power, whose source is the Magog river, the outlet of Lake Memphremagog. The Magog, between the lake and its junction with the St. Francis river, falls 320 feet, and its picturesque rapids are within the city limits, affording abundant power for manufacturing. The leading industrial establishments are woolen, pulp, paper, lumber, and carpet mills and manufactories of foundry and machine shop products, clothing, beer, cigars, electrical supplies, etc. The value of manufactured articles in 1906, according to the Dominion census, was $3,074,738, as compared with $2,252,293 in 1901, an increase of 36 per cent. The taxable real estate in 1906 was valued at $5,311,277, an increase of over 35 per cent. in ten years. The net debt in 1906 was $288,611. The majority of the population are French Canadians. Sherbrooke and the Eastern Townships, of which it is the center, were originally settled by United Empire Loyalists, who were adherents of Great Britain in the Revolutionary war. Pop. (1901) 11,765; local est. (1907) 14,500.

Shere Ali Khan, Ameer of Afghanistan; born about 1823; succeeded his father, Dost Mohammed, in 1863. During the earlier part of his reign he passed through many vicissitudes, but by 1868 he was fully established on the throne of Kabul. In 1869 he entered into friendly relations with the Indian government. In 1878 a Russian mission was received with honor at Kabul, and shortly afterward permission was refused for a British mission to cross the frontier. Thereupon the British invaded Afghanistan and took possession of the Khaibar Pass and the Kuram Valley. Shere Ali fled from Kabul, accompanied by the members of the Russian mission. He died in Afghan Turkestan, Feb. 21, 1879. He was succeeded by his second son, Yakub, who, however, on account of the Cavagnari massacre, was speedily deposed and deported to India, and was succeeded in 1880 by his cousin, Abdurrahman, who died Oct. 3, 1901. See AFGHANISTAN.

Sheridan, Philip Henry, an American military officer; born in Albany, N. Y., March 6, 1831; was graduated at the Military Academy at West Point in 1853. Entering the United States artillery, he served in Texas and Oregon till 1855, when he sailed for California to take command of a cavalry escort of an expedition for surveying a railway route from Fort Reading, Cal., to Portland, Oregon. Afterward he commanded a body of troops among the Indian tribes till 1861, when he was promoted captain. On the breaking out of the Civil War he was appointed quartermaster of the army in southwestern Missouri; in 1862 became chief quartermaster of the Western Department, and colonel of the 2d Michigan Volun-

teer Cavalry. He cut the railroads S. of Corinth; defeated two separate forces of cavalry at Baldwin and Guntown in June, 1862, and fought at Booneville; was promoted Brigadier-General of volunteers; took command of the 11th Division of the Army of Ohio; distinguished himself at Perryville and at Stone river or Murfreesboro, Dec. 31 and Jan. 3, 1863, for which he was promoted Major-General of volunteers. He was engaged at Chickamauga, Sept. 19 and 20, 1863, and in the operations around Chattanooga; was appointed, in April, 1864, to the command of the cavalry corps of the Army of the Potomac; took part in the battles of the Wilderness, Meadow Bridge, and Cold Harbor, in May; in June, led a cavalry expedition into the heart of the Confederate country and was given the command of the Army of the Shenandoah; defeated General Early in several engagements in the Shenandoah valley. On Oct. 19 occurred his famous ride from Winchester. Under orders from Grant he devastated the

PHILIP HENRY SHERIDAN.

valley. He was appointed to the chief command of the cavalry, which branch of the Federal forces, under his able and energetic direction, acquired an efficiency and gained a reputation such as it had never borne before. Sheridan was promoted Brigadier-General, U. S. A., Sept. 20, 1864, and Major-General, Nov. 8 of the same year. On Feb. 9, 1865, the thanks of Congress were tendered to him for "the gallantry, military skill, and courage displayed in the brilliant series of victories achieved by his army in the valley of the Shenandoah, especially at Cedar Creek." After the capture of Staunton, he pressed on to Columbia, laying waste the country in every direction; gained the battle of Five Forks, April 1, 1865; assisted in compelling the Confederate forces to evacuate Petersburg and Richmond, and near Appomattox Court-house encountered General Lee, who surrendered April 9. General Sheridan was in command of the Military Division of the Southwest from June 3 to July 17, 1865; of the Military Division of the Gulf, July 17, 1865, to Aug. 15, 1866; of the Department of the Gulf, Aug. 15, 1866, to March 11, 1867; of the District of Louisiana and Texas, March 11 to Sept. 5, 1867; and of the Department of the Missouri, Sept. 12, 1867. On March 4, 1869, he was promoted Lieutenant-General, and Nov. 1, 1883, succeeded Sherman in command of the army. Congress revived the grade of general, to which he was appointed, June 1, 1888. He died in Nonquitt, Mass., Aug. 5, 1888.

Sheridan

Sheridan, Richard Brinsley Butler, an English dramatist; born in Dublin, Ireland, Sept. 30, 1751; son of Thomas Sheridan (1721–1788); educated in Dublin and at Harrow. In 1772 he eloped to France with Miss Linley, a young singer of great beauty and accomplishments. In 1775 he brought out "The Rivals," which attained a brilliant success. On Nov. 21 he produced the comic opera "The Duenna," which had a run of 75 nights, an unprecedented success. In 1776 he became one of the proprietors of Drury Lane Theater, where in 1777 appeared "The School for Scandal," his most famous comedy, and in 1779 "The Critic," a farce. In 1780 he became a member of Parliament. In 1782 he became under-secretary of state; in 1783, secretary of the treasury; in 1806 treasurer of the navy and privy-councillor. His greatest effort as an orator was his "Begum" speech on the impeachment of Warren Hastings (1787). His wife died in 1792. In 1795 he married Miss Ogle, a daughter of the Dean of Winchester. His parliamentary career ended in 1812. In addition to the plays mentioned, he wrote: "A Trip to Scarborough" (1777); "The Stranger," and "Pizarro" (1799). His speeches were published in five volumes (1816). He died in London, July 7, 1816, and was buried in Westminster Abbey.

Sheridan, Thomas, an English scholar; grandfather of Richard B. Sheridan; born in 1684. He was a close friend and confidant of Swift's, and was noted for his learning and eccentricities. He wrote the "Art of Punning," and published an edition of Persius. He died in 1738. His son, THOMAS, father of the dramatist; born in 1721; was educated at Westminster School and Trinity College, Dublin. He became an actor and teacher of elocution, and published a "Plan of Education, "Life of Swift," and a "Dictionary of the English Language." He died in 1788. His wife, FRANCES CHAMBERLAINE (1724–1766), was the author of two novels, "Sidney Biddulph" and "Nourjahad"; and two plays, "The Discovery" and "The Dupe."

Sherif, an Arabic title equivalent to noble, borne by the descendants of Mohammed. It descends both in the male and female line. Those who possess this rank are distinguished by green turbans and veils, green being the color of the Prophet. The title is applied specifically to the chief magistrate of Mecca.

Sheriff, the chief officer of a shire or a county, to whom is intrusted the execution of the laws, the serving of judicial writs and processes, and the preservation of the peace. In the United States the sheriff is either elected by the legislature or the citizens, or appointed and commissioned by the executive of the State. The office is almost exclusively ministerial. The sheriff, in person or by deputy, executes civil and criminal process throughout the county, has charge of the jail and prisoners, attends courts, and keeps the peace. His judicial authority is generally confined to ascertaining damages on writs of inquiry, etc.

In England the sheriff is the chief officer of the crown in every county or shire, to whom the charge of the county is committed by letters patent. He is appointed (except in the case of London and the county of Middlesex) by the crown out of three names submitted for each county by the judge who goes on circuit. Unless specially exempted, or in case of legal disability, the person nominated is bound under penalty to serve the office. As keeper of the peace, the sheriff is the first man in the county, and during his year of office is superior in rank to any nobleman in the county. He is specially intrusted with the execution of the law and the preservation of the peace in his county, for which purpose he has at his disposal the whole civil force of the county. Personally, the sheriff performs only such duties as are purely honorary, as attendance on the judges on circuit, or duties of dignity or public importance, as presiding over elections and the holding of county meetings. The ordinary functions, such as execution of writs, etc., are discharged through an under-sheriff, so called to distinguish him from the sheriff, who is often popularly known as the high-sheriff.

In Scotland the sheriff is a law officer whose functions seem to have been originally, like those of the sheriffs in England, mainly executive, but who now is judge in a county court. The office is by the appointment of the crown. Nearly all the sheriffs are now practicing lawyers resident in Edinburgh, sheriff-substitutes acting for them as local judges in the several counties. The sheriff-substitute can try criminal cases when a conviction will not involve more than two years' imprisonment. The lord-lieutenant of a Scotch county sometimes receives the honorary title of sheriff-principal.

Sherman, a city of Texas, county-seat of Grayson co., 64 miles N. of Dallas; on the Houston and Texas Central, Missouri, Kansas, and Texas, Texas and Pacific, Gulf, Colorado, and Santa Fé, St. Louis Southwestern, and St. Louis and San Francisco railroads. Here are located Austin College (Pres.), North Texas Female College (M. E.), Carr-Burdette College, and St. Joseph's Academy (R. C.). Water works and electric and gas lighting plants are owned and operated by the city. The three National banks had in 1907 deposits aggregating $3.-000,000. Cotton, corn, fruit, and other products are extensively shipped from the city. Cotton-ginning and various manufactures (cottonseed oil, flour, etc.) are carried on. In 1907 the assessed property valuation was $6,145,000. The municipal charter was received in 1895. Pop. (1900) 10,243; (1910) 12,412.

Sherman, Frank Dempster, an American poet; born in Peekskill, N. Y., May 6, 1860. Educated at Columbia College and Harvard University, he became adjunct professor in the Columbia School of Architecture. He published: "Madrigals and Catches"; "Lyrics for a Lute"; and, with John Kendrick Bangs, "New Waggings of Old Tales"; "Little Folk Lyrics"; etc.

Sherman, James Schoolcraft, an American lawyer and politician; born in Utica, N. Y., Oct. 24, 1855; was graduated from Hamilton College in 1878, admitted to the bar in 1879, and engaged in practice at Utica, of which city he was mayor in 1884. He was chairman of the New York State Republican convention in 1895 and 1900, and member of Congress from 1887 continuously (except in 1891-93) to 1908, when he was elected Vice-President on the ticket with William H. Taft.

Sherman, John, an American statesman; born in Lancaster, Ohio, May 10, 1823; brother of Gen. William T. Sherman; was admitted to the bar in 1844; served as a delegate to the National Whig conventions of 1848 and 1852; and was a member of Congress in 1855-1861. He took a prominent part in the proceedings of the House; was on the Committee of Inquiry sent to Kansas; and joined the movement for the formation of the Republican party. In 1861-1877 he was in the Senate and there was prominently identified with the support of all measures for the prosecution of the Civil War; defended the protective tariff, the restoration of specie payments, and the refunding of the national debt. He was a member of the committee that visited Louisiana to supervise the counting of the returns of that State, and a member of the Electoral Commission. He was Secretary of the Treasury in 1877-1881, and superintended the resumption of specie payments in 1879, after a suspension of 17 years. He was reëlected to the Senate in 1881 and continued to hold that office till 1897, when he

was appointed Secretary of State by President McKinley. He resigned that office however, in 1898, on account of failing health. In 1885 he was president of the Senate *pro tem.*, but declined reëlection at the end of the 49th Congress. He was a candidate for the presidential nomination in 1884 and 1888. Among his publications are: "Selected Speeches and Reports on Finance and Taxation" (1879); and "Recollections of Forty Years in the House, Senate, and Cabinet" (1893). He died in Washington, D. C., Oct. 22, 1900. See SHERMAN ACT.

Sherman, Roger, an American statesman; born in Newton, Mass., April 19, 1721; was early apprenticed to a shoemaker, and continued in that trade till 1743, when he removed to New Milford, Conn., and engaged in mercantile business with his brother. In 1745 he was appointed surveyor for his county, and not long afterward furnished the astronomical observations for an almanac published in New York. He was admitted to the bar in 1754; was several times elected to the Colonial Assembly; and in 1759 became judge of the Court of Common Pleas. Having removed to New Haven, Conn., in 1761, he became judge of the Common Pleas there in 1765, and a member of the upper house of the Legislature. He was a member of the Continental and National Congress in 1774–1791; one of the committee to draft the Declaration of Independence, of which he was a signer; and in 1787, in conjunction with Dr. Samuel Johnson and Oliver Ellsworth, served as a delegate to the convention charged with the duty of framing the Federal Constitution. He died in New Haven, Conn., July 23, 1793.

Sherman, Thomas West, an American military officer; born in Newport, R. I., March 26, 1813; was graduated at the United States Military Academy in 1836 and assigned to duty with the 3d Artillery. He served in the Florida and Mexican Wars, and for his services in the latter was brevetted major, Feb. 23, 1847. At the outbreak of the Civil War he was placed in command of a battery of United States artillery, and later was made chief of light artillery in the defense of Washington, D. C. He organized an expedition for the capture of Bull's Bay, S. C., and Fernandina, Fla., for the use of the blockading fleet on the Southern coast; commanded the land forces of the Port Royal expedition in 1861–1862; led a division in the Department of the Gulf in 1862–1863, and participated in the siege of Corinth. While leading a column in the assault on Port Hudson, La., on May 27, 1863, he lost his right leg, in consequence of which he was on leave of absence till February, 1864. On his return to duty he was placed in command of a reserve brigade of artillery in the Department of the Gulf, and later took charge of the defenses of New Orleans and the Southern and Eastern Districts of Louisiana. On March 13, 1865, he was brevetted Major-General of volunteers and Major-General, U. S. A., for gallant services during the war. After the war he commanded at Fort Adams, R. I., and at Key West, Fla. He was retired as full Major-General, U. S. A., on Dec. 31, 1870; and died in Newport, R. I., March 16, 1879.

Sherman

Sherman, William Tecumseh, an American military officer; born in Lancaster, O., Feb. 8, 1820. His father, one of the judges of the Supreme Court of Ohio, died in 1829, and William was educated in the family of Thomas Ewing till he had reached the age of 16, when he went to the United States Military Academy; was graduated there in 1840, entered the army, and was promoted to 1st lieutenant in 1841. He acted as assistant adjutant-general in 1847, and obtained a brevet of captain, May, 1848, for meritorious services in California during the war with Mexico. He was appointed commissary of subsistence in 1850, served at St. Louis and New Orleans, but finding his pay inadequate to support his family, resigned his commission Sept. 6, 1853, and removed to San Francisco, where he engaged in the banking business till 1858, when he went to Leavenworth, Kan., leaving there in July, 1859, on being elected superintendent of the Louisiana State Military Institute, which position he resigned when the Civil War began. After the fall of Fort Sumter he was commissioned colonel of the 13th United States Infantry, and commanded the 3d Brigade at the battle of Bull Run, July 21, 1861. On the reorganization of the National army he was made Brigadier-General of volunteers, accompanied General Anderson to Kentucky, suc-

WILLIAM T. SHERMAN.

ceeded him temporarily in command till at his own request he was relieved by General Buell and was ordered to Missouri. In the early part of 1862 he was appointed to the command of a division under General Grant, and acted with great bravery at the battle of Shiloh, April 6; was promoted to Major-General, May 1; and when the Department of Tennessee was formed, in December, was made commander of the 15th Army Corps. At the end of that month he led an expedition to Vicksburg; but the works were too strong to be taken by assault, and he was obliged to withdraw his troops after a severe fight. He commanded the wing of the army that captured Fort Hindman, Ark., Jan. 10, 1863, after which he resumed command of the 15th Army Corps; took part in the siege of Vicksburg, which capitulated July 3, 1863; and led the expedition which captured Jackson city, July 10.

When General Grant was placed in command of the army previously under General Rosecrans, he gave the command of the Department of the Tennessee to General Sherman, who encountered General Longstreet, and obliged him to retreat, Nov. 20; and in February, 1864, made his expedition to Meridian, Miss., and broke up that important railroad center, driving General Polk's army out of Mississippi. Having been charged with the command of the army in Georgia, May 4, he commenced the expedition through that State which ended in the capture of Atlanta, the capital city. General Hood thrice attacked the Federal army and was repulsed, sustaining considerable loss. After his third failure General Hood acted merely on the defensive in Atlanta, which fell into the hands of the Nationals in the beginning of September. In October Hood began his movement toward Tennessee. Sherman followed him as far as Resaca, 75 miles, drove him from the railroad, and then sent part of his army to Tennessee to defend that State, and with the balance began his "march to the sea," to act in concert with the Union army in Virginia against Lee. The distance from Atlanta to Savannah is 290 miles. General Sherman accomplished the march with very little loss in 23 days; and Savannah fell into his hands Dec. 21, 1864. The news of its capture was received with great rejoicing in the North, not only because it showed how triumphant the campaign in Georgia had been, but because it opened up the seaboard of that State and inflicted a heavy blow on the Confederate cause. General Sherman defeated the Confederates at Bentonville, N. C., March 19, 1865, and soon afterward paid a visit to General Grant, to concert those measures for the defeat of General Lee which ended in the submission of that general and that of Gen. J. E. Johnston, who surrendered his army to General Sherman, April 26, 1865, which was one of the closing actions of the war. General Sherman was promoted to the rank of Lieutenant-General, July 25, 1866; succeeded General Grant as General, March 4, 1869; was retired Feb. 8, 1884, and died in New York city, Feb. 14, 1891.

Sherman Act, an act of the United States Congress, approved July 14, 1890. It was the culmination of a long disagreement between the two Houses over a financial policy, neither side being disposed to yield. This bill was supported by Senator Sherman and others as a compromise measure. It instructed the Secretary of the Treasury to buy silver bullion to the amount of 4,500,000 ounces a month, and to issue Treasury notes in payment. Though the bill was approved, the financial policy continued to be a disturbing question and arguments favoring a repeal were presented at almost every opportunity. The business depression of the summer of 1893 was believed to be a consequence of the bill, and President Cleveland summoned Congress to convene in special session, Aug. 7. A bill to repeal the silver-purchasing proviso of the Sherman Act passed the House Aug. 28. In the Senate, the Voorhees bill was presented as a substitute, its provisions being a repeal of the silver-purchasing clause, but affirming bimetallism as a National policy. After a protracted contest the Voorhees bill passed the Senate, Oct. 30. It was concurred in by the House Nov. 1, and the President approved it the same day.

Sherry, a favorite Spanish wine, prepared from small white grapes grown in the province of Andalusia, those which furnish the better qualities being cultivated in the vineyards of Xeres. In the manufacture of sherry the grapes are not gathered till they are quite ripe, and the fermentation is continued till nearly all the sugar has been converted into alcohol. At first it is of a pale straw color, but it darkens with age. Sherries may be divided into natural, containing from 20 to 26 per cent. of proof spirit, and fortified, containing from 30 to 40 per cent.; the reason given for the addition of so much spirit is that the wine will not otherwise stand the voyage. Sherry is not adulterated to any great extent, but many of the cheap sherries are mixtures of low-classed sherries with ordinary white wine, the strength being increased by the addition of alcohol. Sherry is used in many of the wines of the pharmacopœia, as *Vinum ferri*, etc.

Sherryvallies, an American phrase for pantaloons of thick cloth or leather, buttoned on the outside of each leg, and generally worn over ordinary pantaloons to protect from dust or mud when riding on horse-

back; synonymous with the English spatterdashes.

Sherwood, Mary Martha, an English author; daughter of Dr. Butt, chaplain to George III.; born in Stanford, Worcestershire, England, May 6, 1775; and from early years was an indefatigable narrator of stories. In 1803 she married her cousin Henry (afterward Captain) Sherwood, and sailed for India, where she showed strong sympathy with the religious labors of Henry Martyn and Dr. Corrie, Bishop of Madras. Her husband predeceased her (1849), and she died in Twickenham, Sept. 22, 1851. Her first book, the "Traditions," was written when she was 17. Her "Susan Grey" (1802) was one of the first attempts to write on religious subjects for the poor. Of her 77 religious works and stories the least forgotten are the "Little Woodman," "Little Henry and His Bearer," and the "Fairchild Family." A collected edition of her works in 16 volumes was issued in New York.

Sherwood Forest, an ancient royal forest in Nottinghamshire, England, celebrated for the exploits of Robin Hood and his followers.

Sherwood, Sidney, an American educator; born in Saratoga co., N. Y., May 28, 1860; was graduated at Princeton College in 1879 and later studied at the Columbia Law School; practised in New York city in 1885–1888. He then took a three years' course at Johns Hopkins University in history, economics, and politics; and in 1892 was made associate Professor of Political Economy there. He was the author of "History and Theory of Money"; and numerous essays, including "Nature and Mechanism of Credit"; "Alliance with England"; "Philosophical Basis of Economics"; "Tendencies in American Economic Thought"; "Influence of the Trust in the Development of Undertaking Genius" "The New German Bank Law"; etc. Died 1901.

Shetland, or **Zetland Islands** (Old Norse, Hialtlandia, "the viking's land"), a group of above 90 islands (of which 30 are inhabited) lying N. N. E. of the Orkney Islands; together with which they form a county; area, 325 square miles; pop. (1901) 28,166. The principal are the Mainland (60 miles long, but narrow); N. E. of it Yell (20 miles by 6), Unst (11 miles by 6); Fetlar, Walsay, and Bressay. The lonely islands of Foula, 20 miles W. of Mainland, and Fair Island, 25 miles S. of it, are also included in the group. The rocks are chiefly Silurian, highly metamorphosed, resting on Laurentian gneiss, and covered in the S. by fragments of the Old Red Sandstone which characterizes the Orkneys. The coast line of the islands is rocky and precipitous and much indented; their surface is rocky and bare. The highest summit is Rona Hill, 1,590 feet high, in the N. of Mainland; Foula Island attains a height of 1,400 feet.

The scenery of the islands is very grand. Shetland is divided into 12 parishes and contains 17 Established churches, 9 Free churches, 6 Congregational, 5 Baptist churches, and an Episcopal church. The climate is humid and mild, but severe storms rage during winter. It seems peculiarly healthy for the natives, who frequently attain a great age, and enjoy unusual free-

dom from pulmonary diseases. In the latitude of Shetland in midsummer daylight continues throughout the whole 24 hours, while in midwinter the sun is only above the horizon for 5¼ hours.

The chief occupation of the Shetlanders is fishing. Cod, ling, tusk, saithe or coal fish, and herring are caught in great numbers. The bottle-nosed whale and seal are also hunted. Most of the fishermen possess also small crofts of land, on which they raise oats, bere, turnips, and potatoes. They have an excellent character as sailors throughout the mercantile marine, and many are employed in the Arctic whale fishery. The group produces peculiar diminutive breeds of horses, cattle, and sheep. The ponies, called "shelties," are remarkably sure-footed. They were formerly regarded

as common property and ran wild on the moors. Many are exported for use in coal mines. The women spend much of their time in knitting, and Shetland hosiery has long been famous. Though a variety of minerals are found in small quantities, chromate of iron is the only one obtainable in quantities worth exporting. The chief town is Lerwick, 100 miles N. of Kirkwall, with which it communicates by weekly steamers. The only other towns are Hillswick and Scalloway. The chief antiquities are the ruins of Scalloway Castle and of numerous so-called "Pictish" towers, the chief being Mousa, 12 miles from Lerwick.

The Shetland Islands were early peopled by Northmen, and along with the Orkneys were attached to the kingdom of Denmark. Robert St. Clair, Earl of Orkney, held them under the kings of Denmark. In 1469 they were attached to Scotland as dowry of Margaret of Denmark, James III.'s bride. After passing through the hands of various noblemen they were sold in 1766 to Sir Lawrence Dundas, in whose family (the Earls of Zetland) they still remain. Old Norse customs long survived, and are not yet quite extinct, but the English language is now universal. A rich though little-wrought vein of folklore is indicated by the survival of many curious incantations or spell songs, which bear the impress of Odinic origin. A transfigured relic of an Eddic lay — a fragment of Odin's Rune song in a Christianized version — from the lips of an inhabitant of Unst, was received by Karl Blind in 1877.

Shetland Pony, a very small variety of the horse, with flowing manes and tails, peculiar to Shetland. They are very strong, and capable of enduring great fatigue, but do not average more than eight hands in height.

Shevchenko, Taras Grigorievich (shevchen'kō), a Russian poet; born Feb. 25, 1814. His "Kobzar," a volume of lyrics in the Little Russian dialect, appeared in 1840 (new ed. 1860), and became at once popular. "Haidamaki," one of the greatest of Russian epics, followed in 1841; after which came "Hamalia," "Maiax," and others. He died in St. Petersburg, Feb. 26, 1861.

Shibboleth (properly Shibbo'leth, Hebrew, "ear of corn," or "stream"), the test word used by the Gileadites under Jephthah after their victory over the Ephraimites, recorded in Judges xii: 6. The latter could not pronounce the *sh*, and, by saying *s*ibboleth, betrayed themselves, and were slaughtered at the ford. All those Hebrew names in the Old Testament which commence with the *sh* have now, through the inability of the Septuagint to render this sound in Greek, become familiar to us, through the versions that flowed from it, as beginning with the simple *s* — *e. g.*, Simon,

Samaria, Solomon, Saul, etc. The word shibboleth is still used to mean a test of opinions and manners.

Shiel, Loch, a fresh-water lake in Scotland, on the boundary between Inverness-shire and Argyleshire. It is about 15 miles long, but extremely narrow. It discharges by the river Shiel, which flows 3 miles N. W. to the sea at Loch Moidart.

Shield, a portion of defensive armor held in the left hand or worn on the left arm to ward off sword strokes or missiles. The earliest known shields date from the close of the bronze age. They are circular and flat, or but slightly convex, with a central boss, under and across which the handle is fixed. The material is thin beaten bronze, strengthened by a turned-over rim round the circumference, and by the surface being embossed with concentric circles alternating with circular rows of small bosses. The Greek shield of the Homeric period was also of bronze, circular, convex, and often ornamented with devices. The Etruscan shield of bronze, of which there is a fine specimen in the British Museum, is also circular and ornamented in concentric bands of embossed work round the central boss. The Roman infantry used a light round shield about three feet in diameter, and the cavalry carried a smaller buckler also of a round form covered with hide, while the spearmen had a large oblong convex shield of wood and leather strengthened with iron, which covered the whole body. The early Germanic shields were also large, oblong, and convex, and Tacitus, in the 1st century of our era, mentions that they were painted with gay colors and devices. These are supposed to have been the precursors of the heraldic devices on the shields of the Middle Ages.

From the downfall of the Roman empire to the 10th and 11th centuries there seems to have been considerable variety in the forms of the shields in use among European nations, though the circular shield was perhaps the most common. The shields of the Anglo-Saxon invaders of England and of the Scandinavian Vikings were mostly circular. But the Norman shield of the 11th century was kite-shaped, and the triangular form continued to prevail till the 15th century, becoming gradually shorter and more obtusely pointed, or heart-shaped. After the 14th century the small round buckler came into fashion, and retained its place till the 16th century. By this time the use of firearms had made the shield practically useless in warfare. The large shields used at tournaments and pageant shields and bucklers were often highly ornamented, some of the latter being among the most beautiful works of art of the Middle Ages. Round shields or targets, covered with hide or leather, ornamented with brass studs and bosses, were

used in the Highlands of Scotland down to 1745. Many savage tribes still use shields of wood or hide of various forms.

Shield Fern, a common name for ferns of the genus *Aspidium,* natural order *Polypodiaceæ,* so named from the form of the indusium of the fructification, which is roundly-peltate or kidney-shaped. The fronds of the species *A. fragrans* possess aromatic and slightly bitter properties and have been employed as a substitute for tea.

Shield, William, a British composer; born in Swalwall, Durham, March 5, 1748; and was apprenticed to a boat builder; but he studied music with zeal by help of Avison, and composed anthems that were sung in the cathedral of Durham; and ere long he was a conductor of concerts at Scarborough. He published a comic opera, "The Flitch of Bacon," in 1778, and, now composer to Covent Garden (1778–1797) produced several other dramatic works, including "Rosina" (1783), "The Poor Soldier" (1784), "The Woodman" (1792), "Two Faces Under a Hood" (1807). But he is best known by his songs, among which are "The Heaving of the Lead," "The Arethusa," "The Thorn," "The Ploughboy," and "The Wolf." The tune of "Auld Lang Syne," as now sung (based apparently on an old Scotch tune), was introduced into his "Rosina," the authorship both of it and of "Comin' through the Rye" have even been claimed for Shield. In 1807 he published "An Introduction to Harmony" (2 vols.), in 1817 "Rudiments of Thorough Bass," and several collections of glees, ballads, trios, etc. In 1792 he traveled and studied in France and Italy. At his death, Jan. 25, 1829, he was Master of the King's Musicians.

Shields, Charles Woodruff, an American theologian; born in New Albany, Ind., April 4, 1825; was graduated at Princeton College in 1844 and later at the Princeton Theological Seminary; was ordained in the Presbyterian Church in 1849, and remained in the pastorate till 1865, when he was made Professor of the Harmony of Science and Revealed Religion at Princeton Theological Seminary. In December, 1898, he became a clergyman in the Protestant Episcopal Church, but still continued in his professorship. His publications include "Religion and Science in Relation to Philosophy" (1875); "Philosophia Ultima" (2 vols. 1877, 1889); "The Order of the Sciences" (1882); "The Historic Episcopate" (1892); "The United Church of the United States" (1896); etc. He died Aug. 26, 1904.

Shields, G. O., an American sportsman; born in Batavia, O., Aug. 26, 1846; was mainly self-educated; served in the Union army in 1861–1865; was a writer for the "Inter-Ocean," "Harper's Magazine," Chicago "Tribune," etc., in 1866–1894. In the latter year when "Recreation" was founded he was made its manager and editor. In 1898 he formed the League of American Sportsmen, of which he was president till 1900. He also formed the Camp Fire Club in 1897, and became its president. His publications include "The Big Game of North America"; "The Battle of the Big Hole"; "Cruising in the Cascades"; "Camping and Camp Outfits"; "The American Book of the Dog"; "American Game Fishes"; and "Hunting in the Great West."

Shields, James, an American military officer; born in Dungannon, Ireland, in 1810; came to the United States in 1826; became a lawyer; served through the Mexican War, and was brevetted Major-General for gallantry at Cerro Gordo and Chapultepec. He was elected to the United States Senate from Illinois in 1849, and from Minnesota in 1857. When the Civil War broke out, he volunteered and entered the Federal service. He commanded the division which defeated "Stonewall" Jackson near Winchester, March 23 1862; was defeated in an engagement with the Confederates at Port Republic, June 9, 1862; and resigned his commission in 1863. He died in Ottumwa, Ia., June 1, 1879.

Shields, South, a municipal and parliamentary borough of England, in the county of Durham, near the mouth of the Tyne, opposite to North Shields, and communicating with it by steam ferry. The industries comprise glass, earthenware, alkali and chemicals, cordage, steam engine boilers, and chain cables and anchors, besides shipbuilding. The ports of North Shields and South Shields, formed by an expansion of the river into a wide bay, have been greatly improved and deepened by dredging and the construction of piers, and are capable of containing vessels of any size at their quays. The total tonnage entered and cleared at North and South Shields in 1898, excluding coastwise vessels, was 2,372,041; the export of coal, coke, and fuel for the same year was 3,774,749 tons. Pop. (1901) 97,300.

Shigatze, or **Digarchi,** a town of Tibet; on the Sanpo or Brahmaputra river; 140 miles W. by S. of Lhassa, at an altitude of 12,000 feet. Near by is the great monastery (3,500 monks) of the Tashilunpo, the residence of one of the Tibetan incarnations of Buddha.

Shiites (also SHEEAHS; "sectaries," from the Arabian *shîah,* "a party), the name given by orthodox Muslims or Sunnites to Ali's followers, who call themselves *al-adelíyyah,* "the right people." They were the champions of Ali's right to be

Mohammed's successor as being his cousin and son-in-law; and after Ali's death they took the side of his sons Hassan (Hasan), Hussein (Hosaín), and Mohammed ibn al-Hanafiyyah. The Persians, believers in the divine right and even in the divine nature of kings, took this side. All Shîites allegorize the Koran; but the ultra-Shîites, founded by Abdallâh ibn Sabâ, a converted Jew of Yemen, differed from the moderate Shîites or Zaidites in believing in the transmigration of souls, and in calling Ali and his legitimate successors incarnations of God. By Shîite help the Abbâsides in 750 wrested the caliphate from the Ommiades. Yet, unsound as the Abbâsides were, and decided as Persian ascendency was for 100 years, the Shîites gained little. They were the strength of the "veiled prophet" in 770–779 and of Bâlek in 817–837. Their disaffection was one chief reason for the introduction of Turks into the caliph's service (830–840).

In 765 the death of Jaafar the Veracious, the Sixth Shîite Imâm, developed the Ismaîli sect of the Shîites. Those followed the eldest son Ismael; the majority, following Moosâ, the second son, were afterward named Twelvers, the series of their Imâms ending with the 12th. In Irâk in 887 arose the Karmathian branch of the Ismaîlis. In 909 an Ismaîli proclaimed himself in North Africa as the first Fâtimide caliph. The 6th caliph of this line, Hâkim, was declared to be God's 10th and final incarnation by Darazî, who founded the sect of the Druses. In 1090 Hassan Sabbâh, an Ismaîli of Khorassân, as the Sheikh of the Mountains instituted the order of Assassins, who generally recognized the Fâtimide caliphate. Ismaîlis are still found in Persia and Syria. The moderate Shîism that has been the national religion of Persia since the native royal line of Safiides ascended the throne in 1499 is more Koranic than Sunnism. It has Hadîth and Sunna, but not those of the orthodox Muslims. It has its own modes of religious washing, and its own postures in prayer.

Shîites, habitually ill-used in Arabia, absent themselves much from Mecca, and, unable to bless Abu-bekr and Omar, who are buried in Medina, go still less thither. But they do pilgrimage unhindered to the tombs of Ali and Hussein in the pashalic of Bagdad, and to the tomb of Riza, one of their 12 imâms, in Meshhed, the capital of Khorassan, and to the tombs of Shîite saints. They keep the orthodox feasts and others, among which the Moharram feast, occupying the first 10 days of the month Moharram, and commemorating the martyrdom of Hussein, is the chief. They detest Ayeshah and the founders of the four orthodox schools, and hold all caliphs save Ali to have been usurpers. They own no caliphate nor imâmate; these have been dormant since the death of Mohammed, their 12th imâm, in 879, but shall be revived in him when he, the Hidden Imâm, reappears as the Mahdi. Shîism, the ancient protest of Persian patriotism against Arabian ascendency, has spread through Afghanistan into India, but toward the West has made no way. The Shîites, divided and subdivided into sects, number 10,000,000, most of whom are Aryans. Toleration and free thought are common in towns and among the more cultivated Persians. In 1736 Nâdir Shah tried but failed to restore the Shîites to orthodoxy.

Shikarpur, an important trading town and capital of a district in the N. of Sind, India, 18 miles W. of the Indus, on the railway leading to Quetta and Pishin. Before the opening of this railway it was a place of very considerable commercial importance, owing to its situation on one of the principal routes between India and Khorassan — viz.: that by the Bolan Pass. It occupies a very low site, the adjacent country being often inundated, but the soil is extremely fertile and yields heavy crops of grain and fruits. Carpets, coarse cottons, furniture, baskets, etc., are made in the town. Pop. nearly 50,000.

Shilka, a river of Eastern Siberia; rises in the Trans-Baikal region, among the Yablonoi Mountains, and after a N. E. course of 260 miles falls into the Amur, a little beyond Ust Strelka. It is navigable for boats to the foot of the Yablonoi Mountains, and is historically interesting as the "point of departure" for the Russians in their conquests on the Lower Amur.

Shillaber, Benjamin Penhallow, an American humorist; born in Portsmouth, N. H., July 12, 1814; was best known as the author of the popular sayings of "Mrs. Partington." He was connected with the "Boston Post," the "Saturday Evening Gazette," and other periodicals, and wrote: "Rhymes with Reason and Without" (1852); "Life and Sayings of Mrs. Partington (1853); "Mrs. Partington's Knitting Work" (1857); "Partingtonian Patch-Work" (1872); "Lines in Pleasant Places" (1874); "Ike Partington and His Friends" (1878); "Cruises with Captain Bob" (1880); "The Double-Runner Club" (1882); etc. He died in Chelsea, Mass., Nov. 25, 1890.

Shillelagh, the cudgel carried by the conventional Irishman, with which he is supposed to delight to play on the heads of his friends on occasion. The name is borrowed from the once famous oak forest of Shillelagh in the S. W. corner of County Wicklow, which in Rufus' day furnished "cobwebless beams" for the roof of Westminster Hall. The railway station of Shillelagh, 16½ miles S. W. of Aughrim, is the terminus of a branch line.

Shilleto, Richard, an English Greek scholar; born in 1810; was educated at Shrewsbury and Trinity College, Cambridge, and took the second place in the classical tripos in 1832. Shortly after graduating he married, and thus made himself ineligible for an ordinary fellowship. For about 35 years his best energies were given to "coaching" or private tuition, and it was only in 1867 that he was elected Fellow of St. Peter's College, and so obtained leisure to realize the great ambition of his life. This was an edition of Thucydides, of which he only lived to publish the first book, dying on Sept. 24, 1876. Almost the only other memorial of his scholarship that Shilleto left was an edition of Demosthenes, "De Falsa Legatione," issued in 1844.

Shilling, an English silver coin and money of account equal to 12 pence, or the 20th part of a sovereign or pound sterling; and equivalent in the United States to about 24⅓ cents. In the United States, a denomination of money formerly in use, differing in value relatively to the dollar in different states, but below that of the English shilling, with a corresponding value for the penny and the pound. The diversity arose from the scarcity of coin in the American colonies, and was fixed at an early period in their history. York shilling, a designation given in some parts of Canada to a silver sixpenny piece or English sixpence.

Shiloh, a town of the tribe of Ephraim, the first permanent resting place of the Tabernacle; the home of Eli and Samuel; and long the religious center of Israel. The site is well ascertained — a ruinous village hidden among the hills 20 miles N. of Jerusalem.

Shiloh, Battle of, one of the most memorable battles of the American Civil War. Shiloh was a locality in Hardin co., Tenn., near Pittsburg Landing, on the Tennessee, and 88 miles E. of Memphis. It took its name from a log chapel known as "Shiloh Church." The battle was fought on April 6 and 7, 1862, Grant and Sherman leading the Federals, and Albert S. Johnston and Beauregard the Confederates. The first day the Confederates, taking the Federals by surprise, drove them from their lines with heavy loss in men and guns; but the second day the Federals, having received reinforcements under Buell, and largely outnumbering the Confederates, regained their lines, and forced the Confederates to retreat to their former position at Corinth. General Johnston was killed on the first day. The Federal loss was placed at 13,573; the Confederate at 10,699.

Shim, in mechanics, a thin piece of metal which is placed between two parts to make a fit. It is sometimes used in adjusting the parts of a journal-box to the crank-pin or wrist either in the original fitting or in taking up lost motion. In stone working, one of the plates in a jumper-hole to fill out a portion of the thickness not occupied by the wedges or feathers. In agriculture, a shallow plow for breaking the surface of land and killing weeds.

Shimonoseki, a town of Japan, at the S. W. extremity of the main island and the W. entrance to the Inland Sea; declared a seaport open to foreign traders in 1890. The batteries and a part of the town itself were destroyed during a bombardment by a combined English, French, Dutch, and American fleet in 1864. Here the peace between China and Japan was negotiated after the war of 1894. Pop. (1908) 58,254.

Shin, Loch, a lake of Scotland, in the S. of Sutherlandshire, stretching N. W. to S. W. about 24 miles, with an average breadth of about 1 mile, and discharging itself by the Shin, which falls into the Kyle of Sutherland.

Shindler, Mary Stanley Bunce Palmer, an American author; born in Beaufort, S. C., Feb. 15, 1810. Her poems, once very popular through the South, include: "The Southern Harp" (1840); "The Northern Harp" (1841); "The Parted Family, and Other Poems" (1842); "The Temperance Lyre" (1842). She has also written "Charles Morton; or, The Young Patriot" (1843); "Forecastle Tom" (1844); and "Letters on the Trinity" (1845). She died in 1883.

Shiner, a little silvery fish found in all American streams from New England to Kansas and Alabama. It grows only about 10 inches long and is of little consequence as a food fish, though boys like to catch and eat it. It has to be cooked soon after it is taken from the water, as its flesh spoils quickly. For this reason it is called in Alabama rot-gut minnow. It is sometimes called also red-fin and red-dace. The shiner furnishes food for the black bass, the trout, and other fish.

Shingle, a thin piece of wood, having parallel sides, and thicker at one end than the other, commonly used as a roof covering instead of slates, tiles or metal. Shingles are laid with ⅓ of their lengths to the weather. They are usually 18 inches long, and so have six inches of margin; this is the gauge of the shingle; the other ⅔ is cover. The excess over twice the gauge is the lap or bond. To hang out one's shingle means to enter in business and announce that business to the public by erecting a sign. The expression arose from the fact that shingles, in the pioneer days of America, afforded cheap and convenient material for such announcements.

Shingles, a popular name for an eruptive skin disease, *Herpes zoster,* which usually starts from the backbone and goes half round the body, forming a belt of inflamed patches with clustered vesicles. It rarely encircles the body, though the popular opinion that if it does it will prove fatal is a delusion. It is sometimes produced by sudden exposure to cold after violent exercise, and sometimes follows acute affections of the respiratory organs. It seems to depend on abnormal nervous action, as it frequently marks out on the surface the part of the integument supplied by some one branch of a nerve. It is usually attended with more or less neuralgic pain and fever. It is a self-limited or cyclical disease, usually running its course in about a fortnight.

Shining Gurnard, in ichthyology, the *Trigla lucerna,* probably named from the brilliant longitudinal silvery band on each side. The Cornish fishermen call this the long-finned captain, from the elongation of the second ray of the first dorsal fin.

Shinn, Charles Howard, an American forester; born in Austin, Tex., April 29, 1852. He was engaged in periodical work till 1885; was business manager of the "Overland Monthly" from 1884 to 1889; became expert and head ranger in the United States Bureau of Forestry in 1902. He is the author of "Mining Camps: A study in American Pioneer Government" (1885); "The Story of the Mine" (1897); etc.

Shinn, George Wolfe, an American clergyman; born in Philadelphia, Pa., Dec. 14, 1839; was graduated at the Philadelphia Divinity School in 1863; was ordained in the Protestant Episcopal Church in 1863; held numerous pastorates in various places. In 1900 he was vice-president and chaplain of the Actors' Church Alliance and preached two sermons in reference to the theater which were published and widely scattered. They are entitled "The Theater as a Place of Amusement" and "The Stage as a Teacher." His other publications include: "Stories for the Happy Days of Christmastide"; "Manual of the Prayer Book"; "Manual of Church History"; "Friendly Talks About Marriage"; "Questions About Our Church"; "The Episcopal Church"; "Confirmation"; etc.

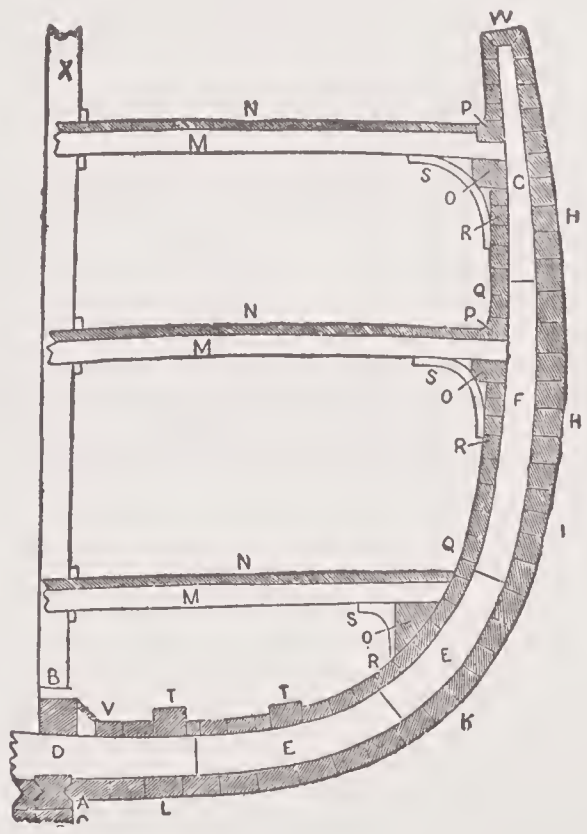
Shinn, Millicent Washburn, an American author; born in Niles, Cal., April 15, 1858. She was graduated at the University of California in 1880; was editor of several publications and of the "Overland Monthly" in 1883–1894; became widely known by her writings on infant psychology.

Shin Plaster, a bank-note, especially one of a low denomination; a piece of paper money. According to Bartlett, from an old soldier of the Revolutionary period having used a quantity of worthless paper currency as plasters for a wounded leg.

Shinto, from a Chinese word, meaning the way of the gods, the religious belief of the people of Japan prior to the introduction of Buddhism from Korea in A. D. 552. The new belief almost entirely absorbed the old, being, however, itself modified in the process. Shinto possesses no moral code. Motoöri (1730–1801) maintained that the will of the Mikado was the criterion of right and wrong. Shinto holds the Mikado to be the direct descendant and representative of the Sun goddess; has associated with it a system of hero worship, and attributes spiritual agencies to the powers of nature. Also, a Shintoist.

Shiogoon, or **Tycoon,** the title of the hereditary military ruler of Japan for many centuries till the revolution of 1868, which reinstated the Mikado in power. See JAPAN.

Ship, in the most general sense, a vessel intended for navigating the ocean. In contradistinction to boat, which is the most



MIDSHIP SECTION OF WOODEN VESSEL.

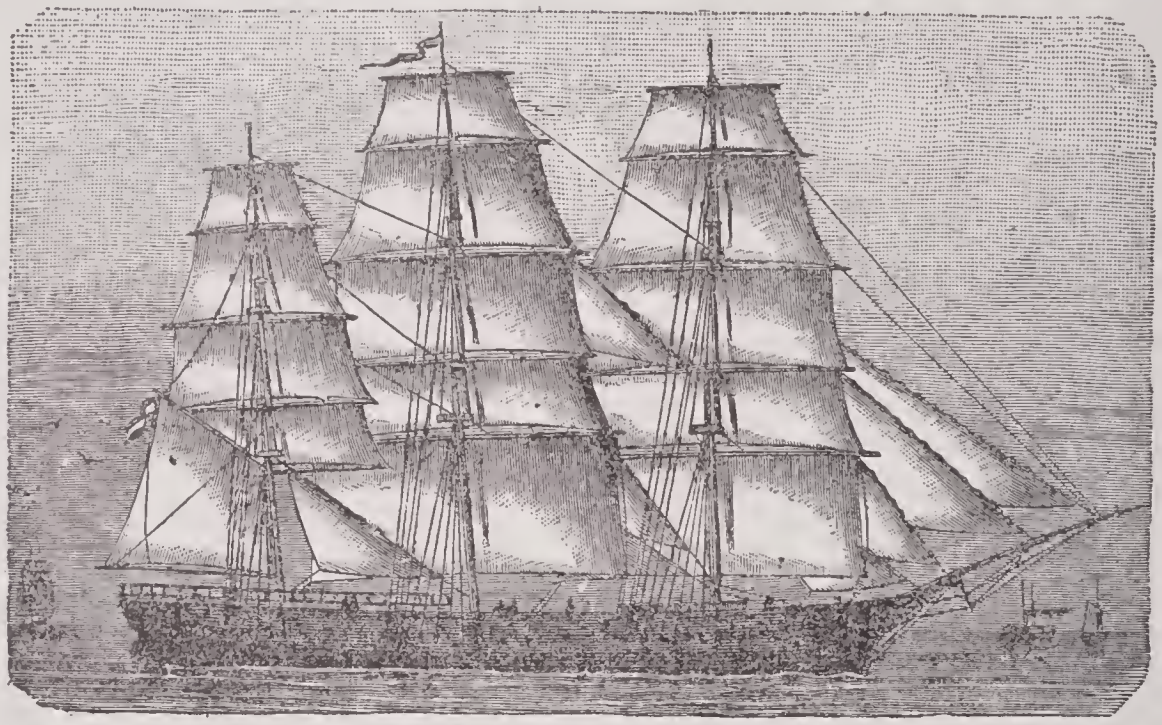
A, keel; B, keelson; C, false keel; D, floor; EE, futtocks; F, top-timber; G, lengthening piece; HH, wales; I, diminishing planks; K, bottom planks; L, garboard strakes; M, beam; N, deck; O, shelf; P, waterway; Q, spirketting; R, clamps; S, knees; T, side keelsons; V, limber strakes; W, rough-tree rail; X, mast.

general term for a navigable vessel, it signifies a vessel intended for distant voyages. Ships are of various sizes, and fitted for various uses, and receive various names, according to their rig and the purposes to which they are applied, as man-of-war ships, transports, merchantmen, barques, brigs, schooners, luggers, sloops, xebecs,

Ship

galleys, etc. The name as descriptive of a particular rig, and as roughly implying a certain size, has been used to designate a vessel furnished with a bowsprit and three or four masts, each of which is composed of a lower mast, a top mast, and a top-gallant mast, and carrying a certain number of square sails on each of the masts. These masts are named, beginning with the foremost, the fore, the main, and mizzen masts; and when there is a fourth it is called the jigger mast. The principal sails are named according to the masts to which they belong. Owing to increase of size and the development of steam navigation the restricted application of the term ship is now of little value.

There were two primitive types of ship-building from one or other of which, or



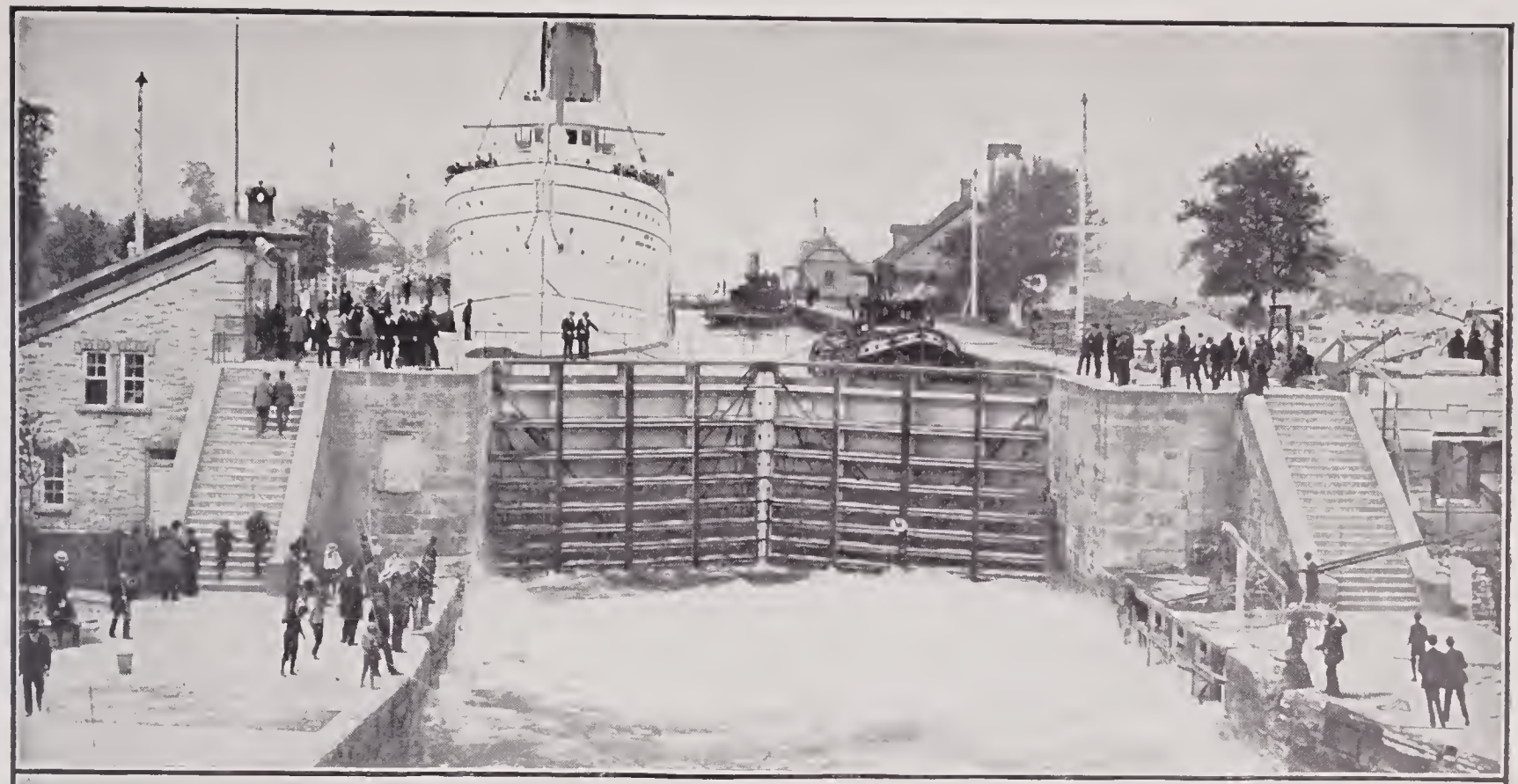
FULL-RIGGED SAILING-SHIP.

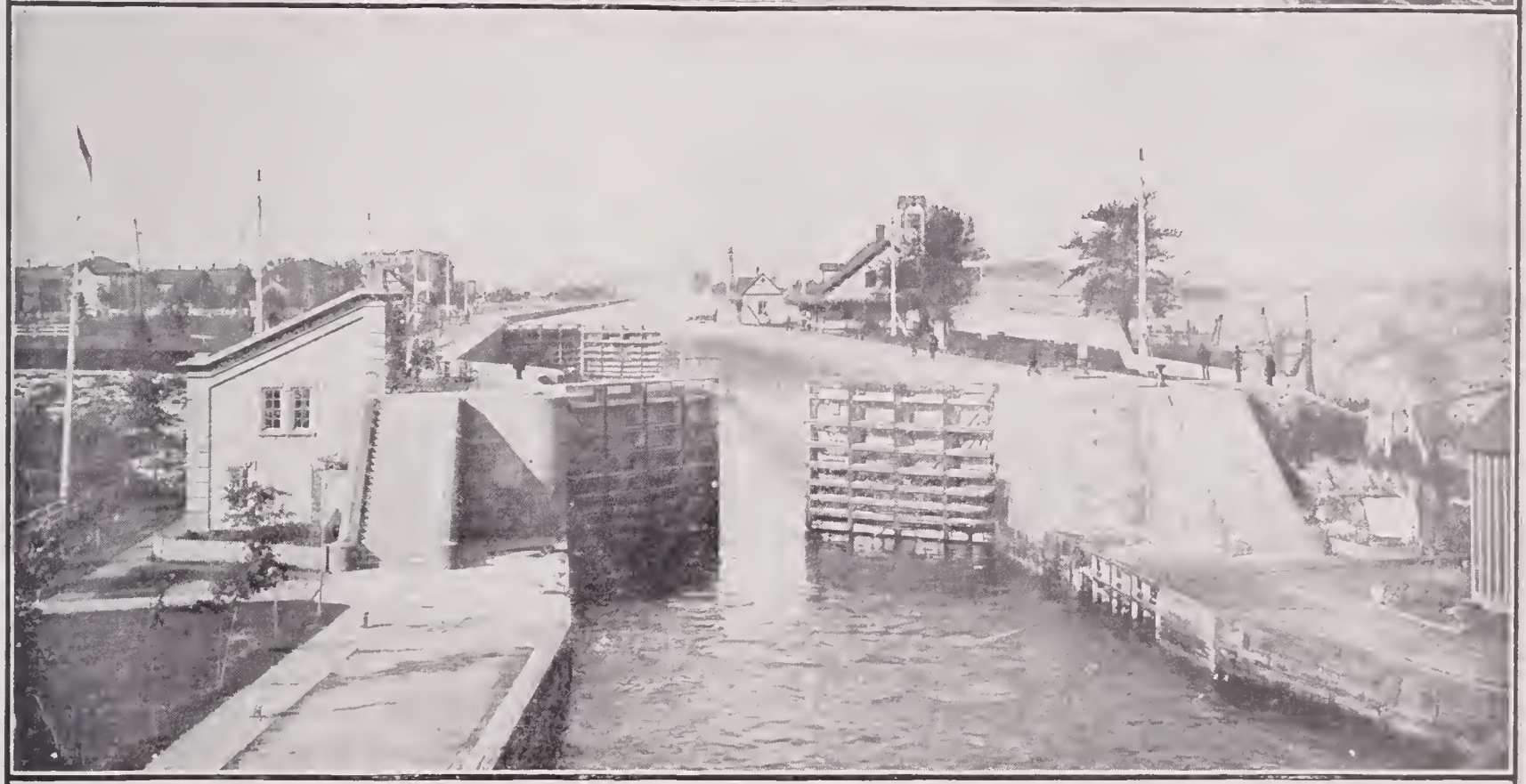
rather perhaps from a joint development of both, all the improvements of modern times have proceeded. These were the raft and the canoe: the one, formed by fixing together planks and spars, gave a floating surface strong and buoyant enough to support a cargo; the other, made by hollowing out the body of a tree and sharpening the ends, gave with little constructive art the rude model of a form fitted for navigation. In like manner there have been from time immemorial two distinct modes of propulsion, by oars and sails.

The ancient art of ship-building, like many other arts, was lost in the overwhelming tide of barbarism which overthrew the last of the great empires of antiquity. The ruder nations of Europe had to begin again in great measure on their own resources. The war galley of the ancients may possibly be so far preserved in the mediæval galleys applied to the same purpose. On the Mediterranean, too, an unbroken line of coasting ships may probably have continued to sail. But it appears evident that the progress made in ship-building under the Roman Empire, not to speak of the Phœnicians and other earlier navigators, was much greater than was transmitted to mediæval Europe.

Ship-building made little progress in Europe till the discovery of the compass, which was introduced in a rude form in the 12th century, and had been improved and had come into common use in the 14th century. The opening up of the passage to India and the discovery of America made another epoch in its progress. In the building of large vessels the Spaniards long took the lead, and were followed by the French, who specially distinguished themselves in the theoretical study of the art. In the early progress of the art of ship-building the English took little or no part. When Henry VII. built the "Henri Grace à Dieu," which is regarded as the parent of the British navy, the English were greatly inferior to the nations of Southern Europe both in navigation and in ship-building. In the reign of Elizabeth the English fleet proved its superiority to that of Spain in respect of fighting capacity, but it was afterward rivalled by that of Holland. Rapid improvement was made in ship-building during the 17th and 18th centuries in England as well as in the maritime states of the Continent. The first three-decker was built in England in 1637. She was called the "Sovereign of the Seas" and was deemed the best man-of-war in the world. In 1768 the French adopted three-deckers; and from their application of science they acquired a decided superiority in the size and models of their ships over the English.

In the early part of the 19th century the lead in improvement was taken by the United States. English builders were at





VIEWS OF THE SAULT SAINTE MARIE CANAL.

The Weitzel Lock Emptying (upper). The Weitzel Lock Empty (centre).
The Poe Lock Empty (lower).

Ship

first sceptical as to American improvements; but in 1832 Scott Russell theoretically established the principles on which speed in sailing depends — principles which had already been practically applied not only by the Americans, but by the Spaniards. From the time of their theoretical establishment they were rapidly adopted in England, and a race of improvements began between Great Britain and the United States. The true principles of construction both in build and rig were exemplified in the celebrated Baltimore clipper schooners, which were sharp in the bow, deep in the stern, of great length, and lying low in the water, with long, slender masts, and large sails cut with great skill. The same principles were afterward applied to square-rigged vessels, and produced the English and American clipper ships which did so much to develop the trade of India, China, and Australia with both Europe and America.

A great change came over the art of shipbuilding when steam was introduced and wood gave place to iron and then to steel. The first steamer built expressly for regular voyages between Europe and America was the "Great Western," launched in 1837. She was propelled by paddles, but about the same time Ericsson invented his screw propeller, which was soon adopted in sea-going ships, and the British Admiralty possessed a screw vessel in 1842. Iron vessels were built early in the 19th century for canal service, then for river service, and later for packet service on the coasts. In an iron vessel, the same strength may be obtained with less weight than in a wooden one. Iron is also far more manageable than wood, as it can be bent with ease into any required shape. In 1838 the first vessel of this material was built for ocean service, but the first ocean-going steamship in its present form, built of iron and propelled by the screw, was the "Great Britain," launched in 1842. As early as 1855, iron was substituted for wood in the yards on the Clyde; and on the Mersey, the Tyne, and the Wear, iron ship-building was in general adoption by 1863 or earlier. Experiments were made in the use of composite ships of iron and wood or iron and steel, especially by the French, but this type of construction had a short history. Puddled steel was used as early as 1862, and since 1870 Great Britain has led the world in steel ship-building. Before 1890 steel had displaced iron in British shipyards. In wooden ships the keel forms the base of the whole structure; from it rises on either side a large number of ribs, consisting of strong timbers usually built up of several pieces, and having the requisite curvature according to the shape of the vessel; to the ribs are attached by bolts or wooden pins the planks that form the outer skin or covering, the interstices between the planks being made water tight by caulking; internally beams extend from side to side to support the deck or decks. In steel or iron ships the keel is of far less importance than in wooden ships, and does not as in them hold the position of foundation or "back bone" to the whole structure, since an iron vessel ought to be mutually supporting throughout. The keel is constructed of plates riveted together, and sometimes is made hollow. From it, and riveted to it on either side, rise the ribs, which are girders built up of plates, and to the ribs on the outside is fastened the plating. The plating consists of sheets of iron plate overlapping each other at the edges, where they are riveted together. There may be an inner skin of plating as well as an outer. The ribs are tied together and at the same time held apart by beams of iron, which support the deck or decks. The decks consist of wooden planking with thin metal plates below. In the finer class of ships there are water-tight partitions or bulkheads of iron stretching across the vessel from side to side and from keel to deck, with water-tight doors in them, so that if in case of accident water gets into one of them the rest may keep the ship afloat. Sometimes there is also a bulkhead extending lengthwise.

In the United States, the transition from wooden to iron ships took place at the commencement of the Civil War. Among the shipbuilding yards that survived the change was Cramp's at Philadelphia, and the Harlan & Hollingsworth Co., at Wilmington, Del. Though the building of merchant vessels was interrupted (allowing England to acquire the leadership she still maintains), the American shipyards promptly turned out warships. The "New Ironsides," a pioneer type for coast service, was built at Cramp's yards and went into action at Fort Sumter. The lack of efficient yards in the Confederate States was an important factor in the Civil War.

The "St. Louis" and the "St. Paul," two ocean liners built by the Cramp Co. between 1892 and 1896, were constructed entirely of domestic material, thus marking a new era in American ship-building. American yards now receive orders not only from foreign firms for merchant ships, but from foreign governments for war ships. Within a very few years the system of utilizing power has been revolutionized in ship yards. Electric power is largely used at the Cramp yards and almost exclusively at the New York Ship-Building Co.'s plant in Camden, N. J.

During the fiscal year ended June 30, 1902, the Bureau of Navigation reported that 1,657 vessels of 473,981 gross tons were built in the United States and officially numbered, compared with 1,709 vessels of 489,616 tons for the previous fiscal year. The decrease compared with 1901 is

in sail vessels and canal boats, barges, etc. For 1902 new sail tonnage was 101,072 tons; 1901, 128,099 tons. For 1902 new canal boats, barges, etc., aggregated 57,502 tons; 1901, 88,331 tons. New steel steamers aggregated 275,479 tons, compared with 235,265 tons in 1901.

Included in the total new tonnage were 94 vessels, each of more than 1,000 tons, aggregating 315,062 tons, or two-thirds of the output. Of this large construction 41 steel steamships of 158,631 tons were built on the Great Lakes. The lakes also built for ocean trade two West India fruit steamships, the "Watson" and "Buckman," of 1,820 tons each; one cargo steamship, "Hugona," of 2,182 tons, and two large cargo steamships, "Minnetonka" and "Minnewaska," of 5,270 tons each, cut in two to pass the Canadian canals.

The year's new steamships on the seaboard included the transatlantic liner "Kroonland," 12,760 tons, then the largest vessel ever built in this country; the Pacific mail liner "Korea," 11,276 tons, of 19 knots, the largest and fastest merchant steamship on the Pacific; "Shawmut" and "Tremont," of 9,606 tons each, built for the opening trade with the Philippines, and "Alaskan," 8,671 tons, for the New York-Hawaiian.

The "Finland" and "Siberia," sister ships to the transatlantic and transpacific mail liners named; two steamships, "Nevadan" and "Nebraskan," of 4,408 tons each, and two more of 8,000 tons each, for the steam fleet to Hawaii around Cape Horn; nine new ocean vessels of 1,000 tons or more for local coasting trades; two steel full rigged ships, "William P. Frye" and "Atlas," 3,380 tons each; five wooden barkentines of about 1,100 tons each; and 20 large wooden schooners of 34,471 gross tons—these and others that have been built and launched since 1902 have added materially to American shipping, which had already begun to show a marked revival, with promise of steady growth. In 1900 there were 504 sailing vessels and 422 steam vessels built in the United States. There has been a recent revival in sailing-ship construction, especially in New England. One of the largest steel sailing ships ever built in this country was the "Edward Sewell," launched in 1897. In addition to the nine navy yards of the United States and the plants above alluded to, there are important ship yards at Chester, Pa., (Roach's); Elizabethport, N. J., (Crescent Yard); Newport News and Norfolk, Va.; Bath, Me.; Aberdeen, Wash.; San Francisco, Cal., where the famous "Oregon" was built, etc. For modern types of warships see NAVAL FLEET. See also *Navies of the World*, under NAVY: NAVY, UNITED STATES: NAVY YARD.

Ship Canal, a canal for the passage of sea-going vessels. Ship canals are intended either to make an inland or comparatively inland place a seaport; to connect sea with sea, and thus obviate a long ocean navigation; or to promote direct navigation by avoiding natural obstructions.

The artificial waterways which may properly be termed ship canals are nine in number:

(1) The Suez Canal, begun in 1859 and completed in 1869. (2) The Kronstadt and St. Petersburg Canal, begun in 1877 and completed in 1890. (3) The Corinth Canal, begun in 1884 and completed in 1893. (4) The Manchester Ship Canal, completed in 1894. (5) The Kaiser Wilhelm Canal, connecting the Baltic and North Seas, completed in 1895. (6) The Elbe and Trave Canal, connecting the North Sea and Baltic, opened in 1900. (7) The Welland Canal, connecting Lake Erie with Lake Ontario. (8) and (9) The two canals, United States and Canadian, respectively, connecting Lake Superior with Lake Huron.

The length of the Suez Canal is about 90 miles, the cost $100,000,000, the present depth 31 feet, width at bottom 108 feet, and at the surface 420 feet. The number of vessels passing through it grew from 486 in 1870 to 1,494 in 1875, 2,026 in 1880, 3,389 in 1890, and 3,441 in 1900. The tolls charged are about $2 per net registered ton.

The Kronstadt and St. Petersburg Canal, which gives a passageway for great vessels to St. Petersburg, is 16 miles long, including the deepening of the bay channel, 20½ feet in depth, and the total cost is estimated at $10,000,000.

The Corinth Canal, which connects the Gulf of Corinth with the Gulf of Ægina, is 4 miles in length, 26¼ feet in depth, 72 feet wide at the bottom, cost about $5,000,000, and reduces the sailing distance about 175 miles. The average tolls charged are 18 cents per ton and 20 cents per passenger.

The Manchester Ship Canal connects Manchester, England, with the Mersey river and Liverpool. Its length is 35½ miles, depth 26 feet, width at bottom 120 feet and at the surface 175 feet, and it cost $75,000,000. The commerce on the canal showed a growth from 879,204 tons in 1895 to 1,492,320 tons in 1900.

The Kaiser Wilhelm Canal, which connects the Baltic and North Seas through Germany, is 61 miles in length, 29½ feet in depth, 72 feet wide at the bottom, 190 feet wide at the surface, and cost about $40,000,000. The number of vessels passing through it increased from 19,960 in 1897 to 29,095 in 1900, of which latter number 16,776 were sailing vessels. The tonnage in 1897 was 1,848,458, and in 1900 4,282,094. An additional canal connecting the same bodies of water by way of the Elbe and Trave rivers was opened in 1900. Its length is 41 miles, depth about 10 feet, width 72 feet, and cost $6,000,000.

The North Holland Canal, which connects Amsterdam with the sea, cut in 1845, but deepened at a later date, has now a depth of 20 feet and a width of 125 feet at the surface. The Caledonian Canal, which connects the Atlantic and North Sea through North Scotland, is 17 feet in depth, 50 feet in width at the bottom, 250 miles long, cost $7,000,000, and is at its highest point 94 feet above sea-level. The Canal du Midi, cut through France from Toulouse on the Garonne, to Cette, on the Mediterranean, a distance of 150 miles, is 6½ feet deep, 60 feet wide, and 600 feet above sea-level at its highest point, and has 114 locks; total cost $3,500,000.

In America the canals connecting the Great Lakes are the principal ship canals, and are three in number: the Welland Canal, originally constructed in 1853 and enlarged in 1811 and 1900; the Sault Ste Marie, or St. Mary's River Canal, opened in 1855 and enlarged in 1897, and the Canadian Canal at St. Mary's river, opened in 1895. The American and Canadian canals at St. Mary's Falls are practically identical in location and dimensions, and are used interchangeably by vessels engaged in commerce, as convenience may dictate. The depth of the canals at the St. Mary's river is sufficient to accommodate vessels drawing 20 feet of water. The American Canal was originally constructed by the State of Michigan, but subsequently taken charge of by the United States and enlarged at a cost of $2,150,000. The cost of the Welland Canal was about $30,000,000, largely due to the fact that 25 locks are required in surmounting the rise of 327 feet in the distance of 27 miles.

The number of vessels passing through the canals at St. Mary's river has greatly increased in the past few years, while the number passing through the Welland Canal has materially decreased; the number passing through the St. Mary's Canal being in 1873 2,517, and in 1901 20,041, of which 15,837 passed through the United States canal and 4,207 through the Canadian. The number of vessels passing through the Welland Canal decreased from 6,425 in 1873 to 2,202 in 1899. The marked contrast between the business of the St. Mary's Falls and Welland Canals is largely due to the fact that the freights originating in the Lake Superior district and chiefly discharged at Lake Erie ports, and those destined for the Lake Superior freights being chiefly iron, the section contiguous to Lake Erie, the copper, and grain, and the Lake Erie freights for Lake Superior coal and manufactures.

The business of the St. Mary's Falls canals by far surpasses in volume that of any other canal of the world, the freight tonnage of the American and Canadian canals combined being in 1901 24,626,976 registered tons, while the net tonnage of the Suez Canal in 1900 was 9,378,152 tons, and that of the Kaiser Wilhelm Canal 4,282,094 tons.

Shipka Pass, a pass in the Balkans, 47 miles N. E. of Philippopolis, about 4,600 feet above the sea, the scene of a desperate and bloody 10 days' struggle during the Russo-Turkish war (1877). In his futile endeavors to take Fort Nicholas at the summit of the pass from the Russians, Suleiman Pasha lost 20,000 of his best men.

Ship Pendulum, a pendulum with a graduated arc, used in the navy to ascertain the heel of a vessel, so that allowance may be made in laying a gun for the inclination of the deck.

Shippen, Edward, an American physician; born in New Jersey, June 18, 1826; was graduated at Princeton College in 1845, and at the University of Pennsylvania in 1848; appointed an assistant surgeon in the navy in 1849; and commissioned surgeon in 1861. He was on the "Congress" when she was destroyed by the "Merrimac" in Hampton Roads; was present at both attacks on Fort Fisher, as surgeon on the "New Ironsides"; and served in the operations at Bermuda Hundred. After the Civil War he made the Russian cruise under Admiral Farragut; was commissioned medical inspector in 1871; fleet surgeon of the European squadron in 1871–1873; in charge of the Naval Hospital in Philadelphia in 1874–1877; became medical director in 1876; and was president of the naval medical examining board in 1880–1882. He was a member of several medical and naval organizations, and author of "Thirty Years at Sea"; "A Christmas at Sea," and numerous magazine articles.

Ship Railway, a railway system for the transportation of vessels over stretches of land. The most noteworthy one was that planned by James B. Eads for the transportation of vessels across the Isthmus of Tehuantepec. It was devised as a saving in time and money over the Panama or Nicaragua canal routes, and a company was incorporated in 1887 to construct it, but Captain Eads dying soon after the scheme was abandoned.

Ship's Husband, an agent, appointed by the owner or owners of a vessel to see to her repairs, provisions, stores, manning, papers, etc., and in general to see her properly and efficiently equipped preparatory to a voyage.

Ships of War. See NAVAL FLEET: NAVY: NAVY, UNITED STATES.

Ship's Papers, the papers or documents required for the manifestation of the property of the ship and cargo. They are of

two kinds: (1) Those required by the laws of a particular country, as the certificate of registry, license, charter-party, bills of lading, bills of health, etc., required by the laws of the United States to be on board American ships. (2) Those required by the law of nations to be on board neutral ships, to indicate their title to that character.

Ships, Registration of, the enrollment of ships on a government register. In the United States the navigation laws require all vessels to be registered periodically, and steam vessels to be inspected and certificated. A list of merchant vessels is published analogous to Lloyd's list issued in London. The Bureau of Navigation, in the Treasury Department at Washington, has charge of registration. No vessel is entitled to the privileges of a British ship unless registered by the collector and comptroller of the customs, and unregistered ships exercising the privileges of registered ones are to be forfeited; and no ship can be registered as a British ship which is not owned by a natural born or naturalized British subject, or by a body corporate having its principal place of business in the United Kingdom or some British possession. The registration comprises the name of the ship and the names and descriptions of the owners.

Shipton, Mother, a half-mythical English prophetess; born near Knaresborough, Yorkshire, in July, 1488. She was christened Ursula Southiel. Tradition has it that she was the child of Agatha Shipton and the devil. This mythical allegation is probably due to the weird omens and predictions said to have been the product of the "strange sight into futurity" possessed by this woman. Considerable superstition was connected with whatever "saying" was attributed to her. She became the wife of a shipbuilder, Tony Shipton, and died about 1559.

Ship Worm, an animal rightly called the teredo; once thought to be a worm, but is not a worm, though its body looks long and worm-like. It is covered with a sort of sheath or shelly coat, and is a kind of mollusk. It is called ship worm because it bores holes into ship timbers, and often injures them so much that they will crumble at the touch. Not only ships' timbers but all other kinds of woodwork under water are eaten by it. Once the coast of Holland was threatened with a deluge because the ship worm ate the piles of the dyke which kept out the sea, and it cost a great deal of money to repair them.

The ship worm is grayish white and is generally six or eight inches long. The larger end, wrongly called its head, because this kind of mollusk has no head, is the one with which it bores. The other end is divided into what may be called two tails. When the larva or young ship worm is first hatched, it swims around looking for some wood in which it may bury itself. When it finds a piece to suit it, it begins to cut a hole. It is not known exactly how it works, but it has strong muscles in front, and as the wood is softened with water, it is supposed that the moving of these muscles takes out the wood little by little. It feeds on the wood as it goes, and when it is about half way in it covers the sides of the hole with a kind of slimy matter which hardens into a shell. Each teredo makes a hole for itself and never cuts into another hole, though the spaces between are often so thin that the wood is cut up like a honey comb, and a little pressure on the outside will crush it. Ships' bottoms are covered usually with copper plates to save their timbers and planks from these animals.

Shiraz, a city of Persia and capital of the province of Fars; much celebrated in Persian poetry for its climate, its wine and roses, and its beautiful gardens; situated in a broad plain, 115 miles E. N. E. of Bushire and 35 miles S. W. of the ancient Persepolis. It is enclosed by ruined walls, and previous to the earthquakes contained many splendid mosques, bazaars, caravansaries, and other public buildings. The place has now a mean and ruined appearance, and is greatly neglected. The wine of Shiraz, which is very strong and resembles Tokay, is, however, still famous throughout the East. Rose water is prepared in large quantities. Inlaid articles in wood and metal, glass, and woolens are made here. The city was founded in the 8th century, and from its beautiful situation and charming climate became a favorite resort of the Persian princes. In 1812 a destructive earthquake laid a large portion of it in ruins, and another in 1824, which cost the lives of 4,000 of the inhabitants, completed the wreck of its prosperity. It was, however, rebuilt, and numbered 40,000 people, when a third and more terrible visitation, in April, 1853, laid almost the whole town again in ruins, and caused the death of 10,000 people. The tombs of the poets Hafiz and Sādi, both natives of the town, exist in the vicinity. Pop. (about) 25,000.

Shire, in the United States, a division of a State, comprising several contiguous townships. A distinction must be drawn between the application of this word as between English and American usage; as, for instance, it is correct in the United States to say "the county of Berk*shire*"; whereas in England such an expression would be tautological, or, in other words, would convey the sense of "a county of a county."

Shiré, a river of Southeastern Africa, draining Lake Nyassa into the Zambesi, which it enters on its left bank after a course of about 270 miles nearly due S. It

is navigable throughout its entire length, with the exception of about 35 miles of falls and rapids, during the course of which it descends as much as 1,200 feet.

Shire Clerk, in England, an officer appointed by the sheriff to assist in keeping the county court; an under-sheriff; also, a clerk in the old county court who was deputy to the under-sheriff.

Shiremote, or **Shiregemot,** an English court held formerly twice a year by the bishop of the diocese and the alderman in shires that had aldermen and in others by the bishop and sheriffs.

Shirley, James, an English dramatist; born in London, England, Sept. 13, 1596; went to Merchant Taylors' School, whence he passed in 1612 to St. John's College, Oxford. Laud esteemed him highly, but discouraged him from seeking holy orders. He migrated, however, to Catharine Hall, Cambridge, took orders, and held for a short time a living at or near St. Albans, but becoming a Catholic resigned it, taught school for two years and then retired to the metropolis, lived in Gray's Inn, and set up for a play maker. For his plots Shirley drew on his own inventiveness, and Dyce points out that not one, if we except that extraordinary failure, "St. Patrick for Ireland," is founded on events of British history. Beaumont and Fletcher were his models, even more than Ben Jonson, his "acknowledged master." Most of his plays are tragi-comedies and his best work is ever the tragic and pathetic portions. His chief plays were "Love Tricks" (1625); "The Maid's Revenge" (1626); "The Brothers" (1626); "The Witty Fair One" (1628); "The Wedding" (1628); "The Grateful Servant" (1629); "The Traitor," his finest and also his strongest tragedy (1631); "The Changes, or Love in a Maze" (1632); "The Gamester," an admirable comedy, revived by Garrick in 1758 (1633); "The Lady of Pleasure," the most brilliant of his comedies (1635); and "The Cardinal," to the author himself "the best of his flock." In 1646 he printed a volume of his poems, including his masque of "The Triumph of Beauty." As a writer of masques he is second only to Ben Jonson. Among his best was "The Triumph of Peace," presented by the Inns of Court before the king and queen in 1633. The only complete edition of his works is that edited by Gifford and Dyce (6 vols. 1833). There is a selection of five plays with "The Triumph of Peace," in the "Mermaid" series, by E. W. Gosse (1888). He died in poverty, Oct. 29, 1666.

Shirt, a familiar article of male attire, was first worn in England during the pre-Norman period, linen being the material of which it was made. Woolen shirts were introduced later, and in the 10th century the wearing of one was reckoned a severe form of penance. Silken shirts were in use in Chaucer's time, while during the 15th and 16th centuries shirts of fine lawn, richly embroidered on the collar, front, and wrists, were the fashion, and for their display the doublets were worn low-necked and "slashed" in the arms. In Charles II.'s reign much of the shirt was shown, and then it was common to ornament it with cut work representing historical and religious subjects.

Shirwa, or **Tamandua,** a lake of Southeastern Africa, on the Shiré river, to the S. E. of Lake Nyassa. It is a secluded basin, lying at an elevation of 2,000 feet above the sea, and surrounded by mountains which reach a height of 7,000 to 8,000 feet. It is mostly shallow and infested by hippopotami and crocodiles.

Shishak, the name of several monarchs of the 22d or Bubastite Egyptian dynasty. Shishak I.'s name is found in the portico built by the Bubastite dynasty at the great temple of Karnak, and on several statues of the goddess PASHT (*q. v.*), which probably came from Luxor. Jeroboam fled to Shishak from the pursuit of Solomon, who wished to kill him, and lived there during the lifetime of Solomon. On the death of this monarch Jeroboam quitted Egypt and contended with Rehoboam for the possession of the crown. This struggle caused the division of the kingdom of David into two states, that of Israel and Judah. In the fifth year of Rehoboam Shishak marched to Jerusalem with an army of 12,000 chariots, 60,000 cavalry, and an innumerable number of infantry, composed of Troglodytes, Libyans, and Ethiopians. He took the city, the treasures of the temple, and all the gold bucklers which Solomon had made. The conquest of Jerusalem is found recorded on the monuments of Karnak, on which Shishak I. is represented dragging before the god Ammon three files of prisoners, inscribed with various names of places, among them Judæa, Megiddo, Ajalon, Mahanaim, and other towns taken by Shishak in his line of march.

Shitepoke, the small, green heron of North America (*Butorides virescens*). The plumage of its crest and upper parts is mainly glossy green; the under parts are brownish-ash, varied with white on its belly. Also called poke and fly-up-the-creek.

Shittim Wood, the wood of the shittah tree of the Bible, of which the tabernacle in the wilderness was principally constructed, is supposed to be the *Acacia seyal* of the Sinaitic peninsula. It is a light but cross grained and enduring wood, of a fine orange-brown color.

Shivering Mountain, a popular name given to Mam Tor, an eminence on the Peak, in Derbyshire, England, so called because of

its rapid wasting away through the action of the elements. The rock falls off in flakes, or "shivers," and dust.

Shoa, a province in the S. E. of Abyssinia; area, about 26,000 square miles. It consists (like the rest of Abyssinia) mostly of plateaus reaching up to an elevation of 10,000 feet on the S. E. and S., overtopped by higher mountains, and intersected by numerous streams mostly tributaries of the Blue Nile. The capital is Adis Ababa. In 1889 Menelek, King of Shoa, became ruler of all Abyssinia, which in 1896 became an independent state. See ABYSSINIA: MENELEK.

Shoad, or **Shode,** in mining, surface ore in pieces mixed with other matters, and indicating the outcrop of a lode or vein in the vicinity. The method of finding the vein by tracing the shoad stones to their source at the strike is called shoading. Holes dug to prospect or intercept the vein are called shoad pits.

Shock, a collection of sheaves standing together in the field for the grain to ripen; also called a shook or stook. It has usually 12 sheaves, but customs differ. Also a collection of cut stalks of corn standing in the field around a central core of four stalks, whose tops are diagonally woven together and bound at the intersection. This central support holds the stalks while they are being set up, and is called a gallows. The shock should be bound when about one-third of the stalks are in place, and bound again when all are gathered.

In electricity: (1) Frictional, a sensation as of a more or less painful concussion or blow attended by a sudden contraction or convulsion of the muscles, produced by a discharge through them of electricity from a charged body. If a number of persons join hands, the first touching the outside coating and the last the knob of a charged Leyden jar, all will receive a nearly simultaneous shock proportioned to the strength of the charge and the number of persons whom it strikes. (2) Dynamical, the sensation produced in the same way by a current from a charged inductive coil, or from a dynamo-electric machine. Owing to the large quantity of these latter currents, fatal accidents not unfrequently occur. In pathology, a sudden and violent derangement of any organ or of the nervous system, and through it of the general frame, consequent on sudden injury, the sight of anything painful or terrible, or the reception of very startling news.

Shock, William Henry, an American engineer; born in Baltimore, Md., June 15, 1821; entered the United States navy as an assistant engineer in 1845; served in the Mexican War, and was promoted chief engineer March 11, 1851. He superintended the building of the marine engines at West Point, N. Y.; was president of the examining board of engineers in 1860–1862; had charge of the construction of the river monitors at St. Louis in 1862–1863; was fleet engineer under Admiral Farragut at Mobile and later under Admiral Thatcher in 1863–1865; and engineer-in-chief of the navy in 1877–1883, being retired June 15, 1883. He invented and patented numerous improvements in guns, steam devices, etc., and was the author of "Steam Boilers; Their Design, Construction and Management." He died Dec. 18, 1905.

Shoddy, old woolen or worsted fabrics torn to pieces by a machine having spiked rollers (termed a devil), cleansed, and the fiber spun with a certain proportion of new wool, the yarn being afterward woven into

SHOE-BILLED STORK.

the full bodied but flimsy fabric also known as shoddy, and made into cheap cloth, table covers, etc. In shoddy manufacture the substances to be ground are fed on to a table or feed sheet, and conveyed to two fluted rollers, on emerging from which they are vigorously seized by the rapidly revolving teeth of the main cylinder, the latter containing about 1,500 strong, sharp steel teeth, turning at the rate of sometimes 750 revolutions per minute. This high speed results in tearing the rags apart and separating the threads and fiber in such a manner that the whole is finally reduced to a soft, woolly condition.

Shoe, a covering or protection for the foot, usually of leather. The ancients usually wore SANDALS (*q. v.*). The crescent was employed as an ornament on the shoes

of Romans of exalted rank, who appear to have carried on the art of shoe making with great taste and skill. Only one instance is known of an ancient monument exhibiting shoes with separate heel pieces. The custom of making shoes right and left was common in classical times. The fashion of shoes and boots, as has occurred with other articles of dress, has undergone innumerable changes. At one time these were pointed to an extravagant degree and in the 18th century the high heels of ladies' shoes became a monstrosity. See Boots.

Shoe-billed Stork, in ornithology, *Balæniceps rex*, a large stork found on the upper Nile. It figures in many Arab myths. Called also the boot bill.

Shoeffel, Mrs. John B. See Booth, Agnes.

Sholapur, chief town of Sholapur district, Bombay presidency, India, 150 miles from Poona. Its situation between Poona and Haidarabad has made it, especially since the opening of the railway in 1859, the center for the trade of a large extent of country. Its chief industry is the manufacture of silk and cotton cloth. Sholapur was stormed by General Munro in 1818, when the whole of the Peshwa's territories were incorporated in the Bombay presidency. Pop. (1901) 75,288.

Shole, in nautical language, a piece of plank placed under the soles of standards, or under the heels of shores, in docks or on ships, where there are no ground ways, in order to enable them to sustain the weight required without sinking; also, a piece of plank fixed under anything by way of protection, as a piece put on the lower end of a rudder, which, in case of the ship's striking the ground, may be knocked off without injury to the rudder.

Shooter's Island, an island between Newark Bay and Staten Island; chiefly noted for its large shipbuilding plant, where the new yacht for the Emperor of Germany, which was launched Feb. 25, 1902, was built. See Henry, Prince.

Shooting Star, a small celestial body suddenly becoming luminous and darting across the sky, its course being marked by a streak of silvery radiance, which is an optical illusion caused by the rapidity of its passage. See Meteor.

Shore, Jane, the famous mistress of Edward IV.; born in London, was well brought up, and married at an early age to William Shore, traditionally a goldsmith. After her intrigue with the king began her husband abandoned her, but she lived till Edward's death in the greatest luxury, enjoying great power through his favor, yet "never abusing it," as More tells us, "to any man's hurt, but to many a man's comfort and relief." Her beauty was more that of expression than of features, and her cheeks somewhat pale, yet her face was fair beyond others, and "there was nothing in her body that you would have changed, but if you had wished her somewhat higher." Her greatest charm was her bright and playful wit. After the king's death, King Richard III., out of a pretended zeal for virtue, plundered her house of more than 2,000 merks, and caused the Bishop of London to make her walk in open penance, taper in hand, dressed only in her kirtle. Jane Shore survived her penance more than 40 years, dying in 1527.

Shorea (named by Roxburgh after Sir John Shore, afterward Lord Teignmouth, Governor-General of India, 1793–1797). In botany, a genus of *Dipteraceæ*, generally adopted, though a synonym of the Linnæan genus *Vatica*. Large Asiatic trees, with excellent and durable wood. Sepals five, enlarging into long wings; petals five; stamens 25 to 30; fruit three-valved, one-celled, one-seeded. *S. robusta* is the saul tree. *S. nervosa* and *S. tumbuggaia* are from the S. of India; the former yields a clear, yellowish resin like colophony, the latter a dammar used as a substitute for pitch. *S. obtusa* exudes a white and *S. siamensis* a red resin; both are from the Eastern Peninsula.

Shore Hopper (*Orchestia littorea*), a genus of crustaceans of the order *Amphipoda*, having the first pair of legs of smaller size than the second pair. By this, and by its more compressed body, it may be distinguished from the familiar sand hopper, in company with which it is often met with on sandy coasts.

Shore Lark, or **Shore Pipit,** in ornithology, the *Otocorys* (*Alauda*) *alpestris*, a native of the N. of Europe and Asia. The adult male is about seven inches long; in summer, lores, cheeks, gorget, and band on top of head, ending in erectile tufts, black; nape, mantle and upper tail coverts pinkish-brown, white beneath. They nest in a depression in the ground and lay four or five eggs — French-white mottled with dull olive-green or yellowish-brown.

Shorey, Paul, an American educator; born in Davenport, Ia., Aug. 3, 1857; was graduated at Harvard University in 1878; admitted to the bar in Chicago in 1880; was Professor of Greek at Bryn Mawr College in 1885–1892. In the latter year he accepted a similar chair at the University of Chicago. His publications include "De Platonis Idearum Doctrina" (1884); "The Idea of Good in Plato's Republic" (1895); "The Odes and Epodes of Horace" (1898); and numerous contributions to periodicals.

Short, Charles, an American educator; born in Haverhill, Mass., May 28, 1821; was graduated at Harvard University in 1846; was instructor of classics in Roxbury and Philadelphia in 1847–1863. He then accepted the chair of moral and intellectual philosophy and the presidency of Kenyon College, Ohio; was Professor of Latin at Columbia University in 1868–1886. He was identified with numerous learned societies. In speaking of him the Rev. Talbot W. Chambers says: "Dr. Short was remarkable as a painstaking scholar who would have contributed more to classical literature but for his reluctance to let anything pass from his pen till he had exhausted his ability on it." He was author of revisions of Schmitz and Zumpt's "Advanced Latin Exercises" (1860); and Mitchell's new "Ancient Geography"; several translations from the German; an exhaustive essay, "On the Order of Words in Attic-Greek Prose" (1870); etc. He died in New York city, Dec. 24, 1886.

Shorter, Clement King, an English editor; became editor of the "Illustrated London News" in 1891; also had charge of the "Sketch," "Album," and "English Illustrated Magazine," and was generally regarded as one of the ablest and most acute editors in London. His published works comprise: "Fifty Years of Victorian Literature, 1837–1887" (1888); "Charlotte Brontë and Her Circle" (1896); "Victorian Literature: Sixty Years of Books and Bookmen" (1897); etc.

Shorter Catechism, a Presbyterian catechism composed under the direction of the Westminster Assembly. It was called Shorter to distinguish it from the Larger Catechism, which had been finished just previously. A small Committee of Assembly was appointed on Aug. 5, 1647, to prepare the Shorter Catechism. When completed, it was presented to the British Parliament on Nov. 26. Both Houses of Parliament thanked the divines who had composed it, and ordered 600 copies, but requested that proofs should be appended. This being done, the Catechism with proofs was presented to Parliament on April 16, 1648, and ordered to be printed. It was adopted by the Scotch General Assembly on July 28, 1648, the decision being ratified by the Scotch Parliament on Feb. 7, 1649. It is still most extensively used among English-speaking Presbyterians all over the world.

Shorthand, an art by which writing is abbreviated, so as to keep pace with speaking. Its great and general utility has been recognized in every age, and numberless systems have been devised to facilitate its acquirement. It was practised by the ancients for its secrecy as well as for its brevity, and a work is extant on the art, which is ascribed to Tiro, the freedman of Cicero. The first English treatise on stenography, in which marks represent words, was published in 1588 by Timothy Bright, M. D., under the title, "Characterie; an Art of Short, Swift, and Secret Writing by Character." In 1602 appeared "The Art of Stenography, or Short Writing by Spelling Characterie," by John Willis. Notwithstanding the intricacy of this system, in which "arbitraries" are extensively used, it became popular and found many imitators. It was succeeded by the systems of Edmond Willis (1618), Henry Dix (1641), and Jeremiah Rich (1659), the last taught in Dr. Doddridge's academy at Northampton, and described by Locke as "the best contrived I have ever seen." In 1672 appeared "A Pen Plucked from an Eagle's Wing: or, The Most Swift, Compendious, and Speedy Method of Short Writing." The author was William Mason, the most famous shorthand writer of the 17th century. His alphabet was formed from Rich's by altering the signs of six letters, viz., *g, h, j, o, r, w*. In his second edition (1682) Mason altered the alphabet so as to leave only six of Rich's letters; and the third edition (1707) left only five, viz., *e, o, v, w, y*. Gurney, who published his system in 1753, took for his alphabet the signs in Mason's third edition, the first six letters of which are *a, b, c, k, d, e, f*. His vowels, when final, were written, *a* and *e*, at the top of the last consonant; *i* and *y* at the middle; *o* and *u* at the foot.

Medial vowels are written by lifting the pen and writing the next consonant at the upper part of the preceding one for *a* and *e;* in the middle for *i* and *y;* and at the bottom for *o* and *u*. Initial vowels are written by their alphabetic characters. Mason's direction (in which he is followed by Gurney and all authors of *a, b, c* shorthands), to "write words completely according to their sound," means, as Mr. Pitman observes in his "History of Shorthand," "let each vowel represent as many different sounds as it does in the common spelling; and for two or three vowels coming together write the one that will most nearly represent the sound, according to the general use of such vowel character"; or, as Mason himself expresses it, "if a diphthong or two vowels come together in one syllable, set what (consonants) follow in that vowel's place which bears the greatest sound"; thus, the *ea* of *meat* would be considered as an *ee*, and the *ea* of *great* as an *a* (pate, pain), still leaving it doubtful whether the letters *m, e, t* were to be sounded *meet* or *met*, and *g, r, a, t, grate* or *grat*.

In 1767 was published the system of Dr. Byrom, four years after his death, which, however, had been completed as early as

1720. This was in many respects an admirable system — characterized by "simple strokes and no arbitrary characters." In 1785 Dr. Mavor published his "Universal Stenography," an ambitious improvement on Byrom. His alphabet consists of 18 letters, two of which are for vowels. The characters for the vowels are a dot (.) and a comma (,). The comma in different positions indicates *a, e, i;* the dot, *o, u, y.* In 1786 appeared the famous system of Taylor, which was almost universally used previous to the publication of "Phonography" by Mr. Pitman in 1837. Taylor has 22 marks or characters: of these, 16 represent the alphabet; the remaining 6 standing for *ch, sh, th, ious, etc, viz.* There are 20 rules to be observed, but of these, 18 are elaborations of the first two, which are (1) Spell by sound, (2) Vowels are used only at the beginning or end of a word. This system was adapted to the French language by Bertin in 1792, to the Italian by Emilio Amanti in 1809, and to the German by Danzer in 1801, and Berthold in 1819. In 1823 Harding issued an improved edition of Taylor's system, which was much used. In 1812 Lewis published an ingenious system, the alphabet of which was good, though the rules were somewhat complicated. Its chief faults were double letters, such as BL and ST, and symbolical characters. Hunter's "System" (1819) is noted for the ease with which its characters may be correctly formed.

In 1837 appeared Pitman's "Phonography" — the first really popular system. Melville Bell, following in the path marked out by Pitman, founded his system on the sounds of the language. The first sketch appeared in 1849; in 1852 the first complete edition, under the title "Semi-Phonography." An improved edition was published as "The Reporter's Manual" in 1857. Bell's letters are written in three sizes; full size, half size, and "tick" size. Pitman makes his letters of two lengths only, full size and half size (the half-sized letters expressing an additional *t* or *d*). Vowels are expressed in Bell's system by the following rule, which does not distinguish one vowel from another: "*Full*-sized characters are used when a *vowel precedes* the consonant, half-sized when no vowel precedes and a vowel follows, and tick-sized instead of half-sized in all combinations." Exact vowel marks are, however, furnished, and are recommended to be employed in the writing of foreign words and proper names. They are written opposite the top or bottom of the consonant. Pitman's vowel signs are used thus: A dot is placed at the beginning of a consonant to represent *ah*, in the middle of a consonant for *eh*, and at the bottom for *ee;* and so with the short strokes for *aw, oh,* and *oo.* The vowel sign is written heavy to represent a long vowel, and light for a short one, the vowels being paired according to their sounds. There are no short powers to the four diphthongal sounds.

The principal point of difference in the two systems is, that Bell subordinates his alphabet to a theory of sounds which is strictly correct; and Pitman, while acknowledging the principle of a phonetic representation, consults the convenience of the writer in the selection of signs. For example, the broad distinction of voice and breath consonants was first marked by Pitman by the happy expedient of writing heavy strokes for the voice letters *b, d, j, g, v, th* (in *th*en), *z, zh,* and light strokes for the breath letters *p, t, ch, k, f, th* (in *th*in), *s, sh.* Bell adopted the same principle. "Those articulative actions," he observes in his first edition, "which are used without voice, the breath articulations, are, as in Mr. Pitman's 'Phonography,' denoted by a *thin, light* marking of their appropriate symbols. In this way the eye is at once informed of the most important literal relationships, and of those organic identities which reduce the simple actions of speech to but little more than half the number of their representative letters." Five of the articulations that make up our composite speech exist in English only in the voice form, namely, *m, n, ng, l, r,* but the breath forms of *l* and *r* are found in Welsh. No language, so far as is known, employs both the breath and the voice forms of *m, n, ng.* Bell writes heavy strokes for these five letters, and Pitman light ones, except for *ng.* As heavy strokes require increased exertion on the part of the writer, Bell's system is, in this point, inferior to the other for practical purposes. It is only necessary to observe further that in Pitman's system every frequently occurring word is written by one of its letters for brevity. Such words are called "grammalogues," or letter words. Thus *t* is written for *it, n* for *no, w* for *we,* etc. Bell's system is far inferior to that of Pitman in legibility and ease of formation. An ingenious system was published by Moat in 1833, in which the author takes the dot as his basis, "because all figures must emanate from it," divides the circle into 20 characters or signs, and introduces "lines" to mark his vowels with dots.

Shorthand is now largely practised in both England and the United States, and has extended its benefits to many classes besides that of the professional reporter. This is due chiefly to the excellences of Pitman's system and to his activity in disseminating its principles. The existence of two styles of phonography, one adapted for letter writing and the other for reporting — the second, however, being only an exten-

sion of the first, and not a new system in itself — has been the chief basis of the popularity of phonetic shorthand. Rejecting Pitman's system on account of its alleged complexity and the difficulties it presents to the student, Matthias Levy (1862), A. H. Thompson ("Stenography," 1868), and "A 'Times' Reporter," have recurred to that of Taylor, while Mason's has been adopted by Thompson Cooper ("Parliamentary Shorthand," 1858). Popular modifications of Pitman's system have been made in the United States by Graham, Burnz, and Munson.

Short-headed Whale, the *Physeter simus*, a little-known whale, from 6 to 10 feet long, almost porpoise-like in general appearance, specimens of which have been obtained from the Cape of Good Hope, the East Indies, and Australia. Well-marked dorsal behind middle of body, short flippers, and snout with a margin like that of a pig; upper surface black, yellow or light flesh-color beneath.

Shorthorn, a breed of cattle characterized by short horns, rapidity of growth, aptitude to fatten. and good temper. It was produced by Charles and Robert Colling. at Ketton and Barmpton, near Darlington, England, by a process of in-and-in breeding between 1780 and 1818. The Collings were imitated by R. T. and J. Booth between 1814 and 1863; by Thomas Bates between 1818 and 1849. The process has been followed in the United States since 1817.

Shorthouse, Joseph Henry, an English novelist; born in Birmingham, England, Sept. 9, 1834. His best known novel is "John Inglesant" (1881). His other works include: "The Little Schoolmaster, Mark" (1883–1884); "Sir Percival" (1886); "A Teacher of the Violin" (1888); "Blanche, Lady Falaise" (1891); etc. He died March 4, 1903.

Shoshone Falls, an attractive fall in the Lewis or Snake river, Idaho. They rank among the waterfalls of North America, next to those of Niagara in grandeur, being about 250 yards wide and 200 feet high.

Shoshone Indians, a family of American Indians. also known as Snakes, living since 1805 to the W. of the Rocky Mountains; they are now on four reservations, two in Idaho (1,231), one in Wyoming (842), and one in Nevada (329). Hostilities ceased in 1867, after an expedition had destroyed a great part of their braves and stores. Total number (1899) 2,402.

Shoshong, the capital of the Bamangwato tribe, and the largest native town in South Africa; in British Bechuanaland, at the base of the Mangwato Hills, not far from the N. W. frontier of the Transvaal. Connected by telegraph with Kimberley, Shoshong (Khama's town) is a great trade center; three routes from Cape Colony enter the town, and three start hence for the interior — to Matabeleland, the Zambesi, and Lake Ngami. The exports are chiefly ostrich feathers, ivory. and skins; Manchester piece goods and Sheffield hardware are among the imports. Pop. variously stated at 15,000 to 30,000 — the former the more likely.

Shot, any solid projectile; those for cannon and carronades being of iron, those for small arms of lead. The latter are known as bullets and small shot. The usual method of making the small shot used in numbers at a time for killing game and other small animals resembles, in some respects, the natural process by which rain is converted into hail. Melted lead is made to fall through the air from a considerable elevation, and thus leaden rain becomes cooled and solidified into leaden hail or shot. To carry out this manufacture, shot towers and shot wells had to be constructed. At the top of the tower melted lead is poured through a colander, and the drops are received into a vessel of water below. The colanders are generally hollow hemispheres of sheet iron, about 10 inches in diameter. The size of the holes varies in different colanders, according to the size of the shot required. When the shot are taken out of the water they are dried on metal plates heated by steam. The imperfect shot are afterward separated from the spherical in the following manner: A polished iron plate is tilted at a certain angle, and the mixed shot are strewed along the upper part of the inclined surface; the spherical shot roll down the plane in straight lines, and fall into a receptable placed for them about a foot from the bottom of the iron plates; the imperfectly formed shot roll with a zig-zag motion, and more slowly, and then fall, without any bound, into a bin placed for them immediately at the bottom of the iron plate. The perfect shot are next polished and made black with plumbago, and are then ready for sale. Shot towers are often of considerable height, the highest being one at Villach, in Carinthia, where there is a fall of 249 feet. There are many having a height of 100 to 150 feet. The shot discharged from artillery are no longer made solid, if of more than three pounds in weight, except when made for old style ordnance, such as smooth bore or Armstrong guns. Even the Pallister chilled shot used for piercing armor are not solid, but are made with a small internal cavity. Bar shot, formerly used to destroy the spars and rigging of a ship, were double headed shot composed of a bar with a ball at each end. Chain shot were similar in purpose, they being connected by a chain instead of a bar. Grape shot, an obsolete device, consisted of

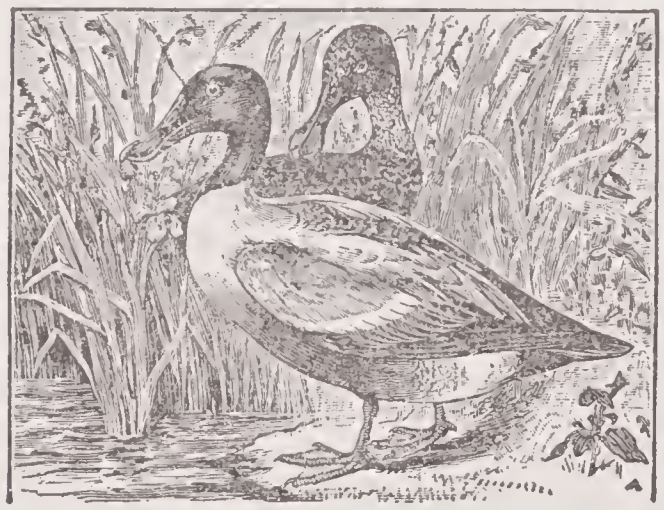
small iron balls, of from one pound to two pounds in weight, held together on a spindle by canvas or by iron plates so as to be easily inserted in a gun. Case shot, or canister, consists of a tin cylinder filled with bullets, and of the proper size to fit the bore of the gun. It is used to ward off an overwhelming or sudden attack, as of boats or of cavalry. See PROJECTILES: PALLISER PROJECTILES; SHELL.

Shoulder Joint, the articulation of the upper arm or humerus with the glenoid cavity of the scapula or shoulder blade (see ARMS). The shoulder joint forms an example of the ball-and-socket joints, the ball-like or rounded head of the humerus working in the shallow cup of the glenoid cavity. Such a form of joint necessarily allows of very considerable movement, while the joint itself is guarded against dislocation or displacement by the strong ligaments surrounding it, as well as by the tendons of its investing and other muscles. The muscles which are related to the shoulder joint are the supraspinatus above, the long head of the triceps below, the subscapularis internally, the infraspinatus and teres minor externally, and the long tendon of the biceps within. The deltoid muscle lies on the external aspect of the joint, and covers it on its outer side in front and behind as well, being the most important of the muscles connected with it. The movements of the shoulder joint consist in those of abduction, adduction, circumduction, and rotation — a "universal" movement being thus permitted; and its free motion is further aided, when the bony surfaces are in contact, by separate movements of the scapula itself, and by the motion of the articulations between the sternum and clavicle, and between the coracoid process and clavicle also. The biceps muscle, from its connection with both elbow and shoulder joints, bring the movements of both into harmonious relation. The shoulder joint is liable to various diseases and injuries. Local injury may result in inflammation of the joint, while special diatheses or diseased conditions of constitutional origin may each give rise, either *per se* or through injuries, to such lesions as strumous or scrofulous disease of the joint, to syphilitic lesions, and to gouty or rheumatic attacks. Of the accidents to which the joint is liable dislocations are by far the most frequent.

Shove=board, a sort of game played by pushing or shoving pieces of money along a board on which were cut a number of transverse lines, the object being to play the coin so that it rested between each set of lines; also the board on which the game was played. Also called shove-groat, shovel-board, shuffle-board, shove-halfpenny, and shovel-penny.

Shovel, Sir Cloudesley, an English naval officer; born probably in Clay, a Norfolk fishing village, about 1650. He was apprenticed to a shoemaker, but he ran away to sea, and soon rose by his remarkable ability and courage through the grades of cabin boy and seaman to the quarter deck. He served as lieutenant under Sir John Narborough in the Mediterranean (1674), burned four pirate ships under the walls of Tripoli, commanded a ship at the battle in Bantry Bay (1689), and was soon after knighted for his conduct. In 1690 he rose to be rear-admiral of the blue, and took an active part in the battle off Beachy Head; two years later, as rear admiral of the red, he supported Admiral Russell heroically at La Hogue, and himself burned 20 of the enemy's ships. He was sent to Vigo in 1702 to bring home the spoils of Rooke, next served under him in the Mediterranean, and led his van at Malaga. In January, 1705, he was made rear-admiral of England. That year he took part with Peterborough in the capture of Barcelona, but failed in his attack on Toulon in 1707. On the voyage home his ship, the "Association," struck a rock off the Scilly Isles on the foggy night of Oct. 22, 1707, and went down with 800 men on board. Four vessels of his squadron perished with as many as 2,000. Sir Cloudesley Shovel's body was washed up next day and buried in Westminster Abbey.

Shovel Fish (*Scaphiorhynchus cataphractes*), a genus of ganoid fishes belonging to the *Sturionidæ*, or sturgeon family, and found in North American rivers. It is so named from the flattened form of the head.



SHOVELER DUCK.

Shoveler, in ornithology, the *Spatula* (*Ana*) *clypeata*, the broadbill or spoonbill duck, widely distributed over the Northern Hemisphere. Length about 20 inches; bill much widened on each side near tip, somewhat resembling that of the spoonbill; head and upper part of neck in adult male rich green, lower part white, back brown, breast and abdomen chestnut brown. It nests in

some dry spot near water, and lays from 8 to 14 greenish-buff eggs. Also the white spoonbill.

"The flesh is tender, juicy, and of good flavor. The excellence of the canvasback of America, as an article of food, is proverbial, yet Audubon also says that no sportsman who is a judge will ever go by a shoveller to shoot a canvasback."—Yarrell, "British Birds."

Show Bread, or **Shew Bread,** in Judaism, a word modeled on the German *schaubrode,* Luther's rendering of the Hebrew *lehem hapanim* = bread of the faces or face, perhaps meaning designed for the presence of Jehovah. It is called also the "continual shew bread" (II Chron. ii: 4), or, more briefly, the "continual bread" (Num. iv: 7), or "hallowed bread" (I Sam. xxi: 4-6). It was to be set on a table of shittim wood, overlaid with gold (Exod. xxv: 23-29; I Kings vii: 48), and having a blue covering (Num. iv: 7). The shew bread consisted of 12 cakes baked with fine flour, two-tenth deals being in each cake (Lev. xxiv: 5). It was to stand in the Holy Place, and, being sprinkled with frankincense, was there to be eaten each Sabbath by Aaron and his priestly descendants (Lev. xxiv: 9). When the old shew bread was removed, new and hot bread was to take its place (I Sam. xxi: 6). When David was in want of food, he ate the shew bread, though he was not a priest (I Sam. xxi: 3-6), and Jesus approved the deed (Matt. xii: 4; Mark ii: 26; Luke vi: 4). The 12 cakes of shew bread were apparently one for each tribe; the deeper spiritual significance of the bread has been variously interpreted.

Show=down, a term used in card playing, especially in draw poker, describing the action of laying all the hands, face up, on the table, when the players have bet, in order that it may appear which is the winning hand; hence, in a figurative sense, a crucial test; as, When it comes to a show-down he will fail.

Showers of Fishes occasionally fall in different parts of the world, exciting great astonishment. Instances of this kind have occurred in England. On one occasion a shower of small three-spined sticklebacks fell near Merthyr-Tydvil in Wales, sprinkling the ground and housetops over a large area. If caught up by a whirlwind from any of the brackish ponds near the sea, in which this species of fish abounds, they must have been conveyed through the air a distance of almost 30 miles. Another similar instance occurred at Torrens, in the Isle of Mull, in which herrings were found strewed on a hill 500 yards from the sea, and 100 feet above it. Such downfalls are more common in tropical countries. In India a shower of fishes varying from a pound and a half to three pounds in weight has been reported. Sometimes the fishes are living, more frequently they are dead, and sometimes dry or putrefying. They are always of kinds abundant in the sea or fresh waters of the neighborhood. The occurrence of the phenomenon is readily explained by the partial vacuum and strong up-draught produced in the center of a whirling column of air like that of a tornado. Such a whirling column in passing over the surface of a lake or river or of the sea may suck up a considerable quantity of water along with any living creatures that may be in it. This may be carried for a considerable distance, and is discharged as a waterspout or cloudburst when the rotational energy of the whirl is expended. Showers of dead flies have also been reported. The analogous showers of "sulphur" or of "blood" are produced by wind borne pollen from pine trees, or minute organisms of fungoid nature and bright red color. In the latter cases the organic particles probably play the part of dust in causing the raindrops to form. See Blood Rain.

Shrapnel, Henry, an English inventor, entered the Royal Artillery in 1779, served with the Duke of York's army in Flanders, and shortly after the siege of Dunkirk invented the case shot known by the name of shrapnel shells, an invention for which he received from government a pension of $6,000 a year in addition to his pay in the army. He retired from active service in 1825, attained the rank of Lieutenant-General in 1827, and died in 1842.

Shrapnel. See Projectiles: Shell: Shot.

Shreve, Henry Miller, an American inventor; born in Burlington co., N. J., Oct. 21, 1785; early engaged in navigation on the Western rivers, and in 1815 ascended the Mississippi to Louisville, Ky., in the "Enterprise," the first steam vessel that ever performed such a voyage. Later he built the "Washington" of 400 tons burden, with improvements on Robert Fulton's steamboat; remodelled it in 1824, so as to operate each of the side wheels with a separate engine; invented the snag boat "Heliopolis," for removing snags and sawyers from rivers; and in 1829 patented a steam battering ram for harbor defense. In 1826 he was made superintendent of improvements in Western rivers, and continued in that office till 1841. He died in St. Louis, Mo., March 6, 1854.

Shreveport, a city and parish-seat of Caddo parish, La.; on the Red river, and on the Texas and Pacific, the Houston and Shreveport, the St. Louis Southwestern, the Queen and Crescent Route, and the Texarkana and Fort Smith railroads; 326 miles N. W. of New Orleans. It is one of the most important cities in Louisiana, owing to its location in a great stockraising and cotton growing region. Here are the

Thatcher Institute, a high school, United States government building, United States Marine Hospital, board of trade, cotton exchange, waterworks, street railroad and electric light plants, National and State banks, and several daily and weekly newspapers. Shreveport has a large trade in wool, cotton, livestock, and hides; cotton gins, cotton seed oil mills, cotton compresses, manufactories of ice, cotton machinery, etc.; and an assessed property valuation of $6,000,000. Pop. (1890) 11,979; (1900) 16,013; (1910) 28,015.

Shrew, in zoölogy, a popular name for any individual of the *Soricidæ*, particularly the common (*Sorex vulgaris*) and the lesser shrew (*S. pygmæus*). The former is about the size of a mouse, which it somewhat resembles in the shape of the body, feet and tail, but has the muzzle produced, with prominent nostrils, far beyond the lip; the eyes are small, and scarcely discernible through the fur; ears wide and short; the tail is four-sided, with the angles rounded off; fur usually reddish-gray above, grayish beneath, but the color varies, and pied specimens often occur. They feed on insects and worms and the smaller mollusca; they are extremely pugnacious, and two males scarcely ever meet without a battle, when the weaker is killed and eaten. They breed in the spring; the female makes a nest of dry herbage in a hole in the ground, and brings forth from five to seven young, but their increase is checked by the weasel and barn owl. In former times the bite of the shrew was erroneously considered venomous, and the animal itself played an important part in folk medicine.

Shrew-footed Uropsile, in zoölogy, the *Uropsile soricipes*, the sole species of the genus, discovered in Eastern Tibet by Père David. The general characters are like those of *Urotrichus*, the tail is naked and scaly, fur slate-color, with a brownish tinge.

Shrew Mole (*Scalops aquaticus*), a genus of insectivorous mammals, belonging to the family of *Soricidæ* or shrew mice, but also by some zoölogists placed in the *Talpidæ* or mole family. It is found in North America, usually near rivers and streams, and burrows after the fashion of the common mole, like which, also, its fur is fine and closely set. The average length is about seven inches.

Shrewsbury, a municipal and parliamentary borough of England, capital of Shropshire, situated on a slightly elevated peninsula formed by a bend of the Severn, 42 miles N. W. of Birmingham. It consists of some handsome modern houses and many old timbered houses of very picturesque appearance. Three bridges cross the Severn and connect the town with its suburbs. Among objects deserving of notice are the remains of the old walls; the ruins of the castle; the Church of Holy Cross, originally attached to a magnificent Benedictine abbey, founded in 1083; the grammar school, ranking high among public schools, founded by Edward VI. in 1551, and removed to new buildings at Kingsland in 1882; the market house, of the time of Queen Elizabeth; statues of Lords Clive and Hill, etc. The chief manufactures are glass staining, the spinning of flax and linen yarn, iron founding, brewing, the preparation of brawn, and the making of the well-known "Shrewsbury cakes." In 1403 the famous battle which ended in the defeat of Hotspur and the Earl of Douglas his ally by Henry IV. was fought in the vicinity. Pop. (1901) 28,395.

Shreyvogel, Charles, an American artist; born in New York city, Jan. 4, 1861; studied art in Munich under Frank Kirchbach and Carl Marr, and for the excellence of his work was awarded the "Thomas B. Clarke Prize" at the National Academy of Design in New York city, together with a medal at the Paris Exposition in 1900. Among his paintings, most of which deal with Western frontier life, the "Last Stand"; "My Bunkie" and "How Kola" are perhaps the best known.

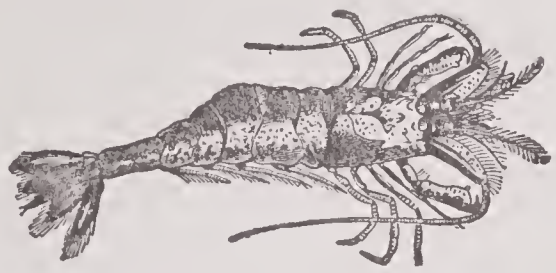
Shrike, in ornithology, a popular name for any individual of the *Laniidæ*, applied specially for the last three centuries to

GREAT GRAY SHRIKE.

Lanius excubitor, the great gray shrike. The length of the adult male is about 10 inches; pearl gray on upper part of body; chin, breast, and abdomen white; tail feathers black, variegated, and tipped with white; a black band crosses the forehead, runs under the eyes, and expands into a patch on the ear coverts. The lesser gray shrike (*L. minor*), from eight to nine inches, which bears a general resemblance in plumage to its larger congener, is an occasional winter visitor. The red backed shrike (*L. colluris*) like *L. septentrionalis*, is often called the nine killer and with one or two other small shrikes is sometimes placed in a genus *Enneoctonus*.

Shrikes feed on insects and small birds, and have a remarkable habit of impaling their prey on thorns in the neighborhood of their nests, which may thus be easily discovered. They kill and impale many insects that they do not eat, and even in confinement they push portions of the food given them between the wires of their cages, or transfix it on a sharp nail, if one be provided for the purpose. See BUTCHER BIRD.

Shrimp, a popular name for any individual of the genus *Crangon*, allied to lobster, crayfish, and prawn. The form is elongat-



COMMON SHRIMP.

ed, tapering, and arched. The rostrum is very short, claws small, the fixed finger being merely a small tooth, the movable finger unciform. The whole structure is delicate and subtranslucent, and of such hues that the species may readily escape observation, whether resting on a sandy bottom or moving through the water. When alarmed they bury themselves in the sand by a peculiar motion of the telson. The common shrimp (*C. vulgaris*), about two inches long, greenish-gray dotted with brown, is esteemed as an article of food; other species, from warmer latitudes, are equally prized. They are usually taken by a net. Also, the *Pandalus annulicornis*, taken in the N. waters of Europe. When alive its color is reddish-gray, with red spots. When boiled it becomes a deep red. It is smaller than the prawn with which, however, it is sometimes confounded.

Shrine, a case, box, or reliquary in which the bones or other remains of saints were deposited. They were often richly ornamented with gold, precious stones, and elaborate carvings, and were generally placed near the altar of the church. The earliest form of the shrine was that of a diminutive model of a church, with a high pitched roof.

Shropshire, or **Salop,** an inland county of England, bounded by Cheshire, the detached part of Flintshire, Denbighshire, Montgomeryshire, Radnorshire, Herefordshire, Worcestershire, and Staffordshire; area, 844,565 acres, of which about seven-eighths are under cultivation; pop. (1901) 239,297. The country is divided into two nearly equal portions by the Severn, running S. E., the N. is generally level; the S. is more hilly, reaching in the Clee Hills a height of 1,805 feet. The principal mineral products are iron, coal, lead, limestone, and freestone. The coal fields are extensive and productive. The soil is generally fertile and well cultivated, though there are extensive tracts of waste land. The principal crops are wheat, barley, oats, peas, vetches, turnips, potatoes, and beans. In the S. and W. cattle breeding and dairy farming are carried on. The county is famous for its breed of sheep. A good deal of cheese is made, and large flocks of turkeys are raised. The manufactures include that of iron to a very great extent, chinaware, carpets, gloves, and flannel.

Shrouds, a range of large ropes extended from the heads of the lower masts to both sides of a ship to support the masts, and named, from the masts to which they belong, the main, fore, and mizzen shrouds. Topmast, topgallant, and bowsprit shrouds are all similar in their object.

Shrove Tuesday. See MARDI GRAS.

Shrub, in botany, a plant with woody stem and branches like a tree, but of smaller size, not generally exceeding 20 feet in height, and branching near the root, so as to have no main stem of considerable height. When a shrub is of small size and much branched, it is often called a bush. There is no more important botanical distinction between trees and shrubs, and the same genus very often includes species of both kinds. Many shrubs, as honeysuckles, are climbers. Also a liquor composed of acid, particularly lemon juice and sugar, with spirit to preserve it.

Shufeldt, Robert Wilson, an American surgeon; born in New York city, Dec. 1, 1850; was graduated at the Medical Department of Columbia University in 1876; served in the East Gulf Blockading Squadron in 1864–1865 under his father, Admiral Robert W. Shufeldt. He was 1st lieutenant and later captain in the medical department of the army in 1876–1889; served as surgeon on the frontier under Generals Sheridan, Crook, and Merritt, in 1876–1881; and was honorary curator of the Smithsonian Institution in 1895–1897. His publications include: "Scientific Photography of Living Fishes" (1900); "Animal Sketches" (1901); "The Anatomy of Birds"; and "Studies of the Human Form" (1901); etc.

Shuffle-board. See SHOVE-BOARD.

Shukows. See ZHUKOVSKI.

Shumla, or **Shuma,** a fortified town of the principality of Bulgaria; on the Little Balkan, to the N. of the main range, at an elevation of 800 feet; 50 miles W. of Varna; and 60 S. E. of Rustchuk. It is of great strategical importance, commanding as it does the roads from the fortresses in the Lower Danube and in the

Dobrudscha, and those from the E. passes of the Balkans. It is closed in on the N. and W. by mountains, and looks out to the E. and S. on an open plain where grain and the vine are cultivated and where there is extensive silk culture. Surrounded by high massive walls, it is further defended by a citadel on the heights, and by several forts. An intrenched camp in the vicinity can accommodate some 60,000 men. The town has 40 mosques, large barracks for cavalry and artillery as well as infantry, an arsenal, military hospital, etc. There are manufactures of copper and tin wares, silk, leather, and wearing apparel. A great fair is held in June. The Russians failed to take the town in 1774, 1810, and 1828. No attempt on it was made in the war of 1877–1878, but the place was evacuated by the Turks on the conclusion of peace. Pop. (1905) 22,275.

Shumway, Edgar Solomon, an American educator; born in Belchertown, Mass., June 6, 1856; was graduated at Amherst College in 1879; then studied abroad, was adjunct and full Professor of Latin Language and Literature at Rutgers College in 1883–1900. He lectured on Roman law at the University of Pennsylvania in 1900, was also for some years university extension lecturer for New Jersey and New York on Greek and Hellenistic and Roman art. His publications include "A Day in Ancient Rome"; "Syllabus of Classical Archæology"; "Latin Synonyms"; "Synopsis of Sources, Literature and Language of Roman Law," and contributions to leading magazines entitled "Concord and Its People"; "The American School at Rome"; etc.

Shurtleff, Roswell Morse, an American artist; born in Rindge, N. H., June 14, 1838; was graduated at Dartmouth College in 1851; worked at lithography and drawing on wood till 1861, when he enlisted with the 99th New York Volunteers, in which he became lieutenant and adjutant. On July 19, 1861, he was wounded and captured, being the first Union officer in the war to suffer these calamities. He was released on parole after nearly eight months' imprisonment. He has made numerous paintings of landscapes in both water and oil; many of the most excellent of these are scenes in the Adirondacks.

Shurtleff College, a coeducational institution in Upper Alton, Ill.; founded in 1827, under the auspices of the Baptist Church; has productive funds exceeding $160,000; grounds and buildings valued at over $125,000; volumes in the library, about 13,000; average number of faculty, 15; average students, 175; graduates since opening, over 420; ordinary income, $25,000.

Shutar Gardan, a mountain pass in Afghanistan, conecting the Kuram and Logar valleys. The ascent from the Indian side is slight, but the descent into the Logar valley is long and very steep. The pass commands the road to Kabul, and the possession of it in 1879 enabled General Roberts to advance on that city and occupy it almost without opposition.

Shute, Daniel Kerfoot, an American physician; born in Alexandria, Va., Oct. 22, 1858; was graduated at Columbian University in 1879, and at its Medical Department in 1883; then took a special course in clinical ophthalmology. He was made Professor of Anatomy at the Medical Department of Columbian University in 1888, and became a member of numerous medical societies. He was the author of "A First Book in Organic Evolution" (1899); and numerous essays including, "Rectal Etherization" (1884); "Chloride of Cocaine" (1884); "Neuro-Myology" (1887); "The Anthropology of the Brain" (1892); "Heredity with Variation" (1897); "Racial Anatomical Peculiarities" (1896); etc.

Shut-in Society, an organization in the United States founded for the purpose of brightening the life of persons in sickness by providing various objects which they would otherwise be unable to obtain. The members of local societies, besides supplying their sick members with fruit, flowers, reading material, medicines, and nourishing food, also undertake to supply easy chairs and other helps to convalescence. The Shut-in Society is not connected with any religious or other organization.

Shuttle, Schyttyl, or **Shyttell,** in weaving, an instrument used by weavers for shooting or passing the thread of the weft from one side of the web to the other, between the threads of the warp. It is a boat shaped piece of wood which carries a bobbin or cop containing the yarn of the weft or woof. The shuttle sometimes has wheels to facilitate its motion. It is thrown by hand or by the fly. In the latter case the ends of the shuttle race form boxes into which the shuttle is received, and out of which it is driven by a smart blow from a pin called a driver or picker. There is one of these pins on each side of the loom, and they are connected by a cord to which a handle is attached. Holding the handle in his right hand, the weaver moves the two pins together in each direction alternately by a sudden jerk. The fly shuttle was invented by John Kay, of Bury, England, in 1735. The shuttle for haircloth weaving has no pirn, but a spring catch to hold the ends of the hair forming the weft, and carry them through the shed when the shuttle is thrown.

In a sewing machine, the sliding thread-holder which carries the lower thread between the needle and the upper thread, to make a lock stitch. In hydraulic engineering, the gate which opens to allow the water to flow onto a wheel. That side of a wheel which receives the water is known as the shuttle side.

Shuvaloff, Peter, a Russian statesman; born in St. Petersburg, Russia, July 15, 1827; became a general in the Russian military service in 1864, and two years later was made chief of the secret police, a position he held for seven years. Soon after he was appointed ambassador to England, and to his diplomatic ability is attributed the fact that England and Russia did not come to an open rupture during their long disputes over their Central Asian interests. The count was opposed to Prince Gortchakoff's policy and was regarded as his rival. He took a prominent part in the Berlin Congress. He died in St. Petersburg, March 22, 1889.

Siagonium, in entomology, the typical genus of *Siagoninæ*. They have porrected horns on the head and thorax. The males are in two sets, differing greatly in the size of their bodies and in the development of their horns. The females are the more numerous sex.

Sialidæ, in entomology, a family of *Planipennia*. Antennæ bristle-shaped or filiform, ocelli generally present, head nearly in front of the thorax, having the mouth in line with it instead of beneath. Fore and hind wings similar except that the front margin of the anterior pair is more dilated. Larvæ nearly all aquatic, pupæ not inclosed in a cocoon.

Sialogogue, one of a class of medicines which produce an increased flow of saliva. Of these there are both vegetable and mineral. The former embrace most of the pungent plants, particularly sorrel, tobacco, pellitory root, and mezereon; of the latter, several of the metals, when taken constitutionally, especially mercury. The first are called masticatories, because the effect is produced by merely chewing the article.

Siam, a kingdom embracing a great part of the Indo-Chinese Peninsula and part of the Malay Peninsula, and lying between Burma on the W., and Annam and Cambodia on the E. and S. E. Its boundaries are ill defined on the N. and N. E., but its area is estimated at about 300,000 square miles, and its pop. (1904) at 6,686,846.

Topography.— A large part of the territory is not well known. Siam proper consists mainly of the low lying alluvial basin of the Menam and its numerous tributaries, which flows S. into the Gulf of Siam, forming an extensive and intricate delta, on which is situated Bangkok, the capital. This alluvial plain, intersected by numerous streams and canals, is extremely fertile, producing crops of rice, sugar, cotton, maize, and indigo. Both sides of the Manam basin are skirted by densely wooded ranges of hills, forming the water partings toward the Salwin and Mekong, the latter of which is the great river of Eastern Siam. The minerals include gold, tin, iron, copper, lead, zinc, and antimony, besides several precious stones, such as the sapphire, Oriental ruby, and Oriental topaz. Mining is chiefly in the hands of the Chinese. Much of Upper Siam seems incapable of being cultivated. During the dry season, which lasts from November to May, there is an utter absence of rain in this region, which again is so flooded by rain during the wet season as to be converted into a vast swampy forest. Cocoa and areca palms are numerous in Siam; fruits are abundant and of excellent quality; black pepper, tobacco, cardamoms, and gamboge are important products. The forests produce aloes wood, sappan wood, teak timber, bamboos, rattans, gutta percha, dammar, catechu, benzoin, etc. Among wild animals are the tiger, leopard, bear, otter, orang-outang, single horned rhinoceros, and elephant, which here attains a size and beauty elsewhere unknown. The last, when of a white color, is held in the highest reverence. The forests abound with peacocks, pheasants, and pigeons; and in the islands are large flocks of the swallows that produce the famed edible birds' nests. Crocodiles, geckoes, and other kinds of lizards, tortoises, and green turtles are numerous. The python serpent attains an immense size, and there are many species of snakes.

Commerce.— Nearly the whole of the trade of Siam is in the hands of foreigners, and the foreign trade centers at Bangkok. The chief export is rice, after which come teak, pepper, dried fish, birds' nests, cattle, and teel seed. The chief imports are gold leaf and treasure and cottons, after which come opium, china goods, gunny bags, hardware, kerosene oil, and silk goods. In 1898 the exports from Bangkok were valued at $17,456,350, and the imports at $13,110,915. The trade is chiefly with Hong Kong and Singapore, and (to a much less extent with Lower Burma and Great Britain. The chief direct exports to Great Britain are teak wood and rice; the chief direct imports from Great Britain are machinery and mill work, wrought and unwrought iron, cottons, hardware, and furniture; besides which large quantities of British piece goods are transhipped at Singapore. Telegraph lines connect Bangkok with Tavoy in Lower Burma, with Pnompenh in Cambodia, and with Chiengmai, the chief city of North Siam, and others are being constructed. There is a postal service at Bangkok, and in 1885

Siam joined the International Postal Union. There are 1,820 miles of telegraph, and some 400 miles of railroad.

People.— The Siamese are members of the great Mongolian family, and of the same race as the people of Burma and Annam. In stature they do not average more than 5 feet 3 inches in height; they have a lighter colored skin than the Western Asiatics, but darker than the Chinese. Elementary education is general, most of the Siamese being able to read and write. The houses are mostly constructed of timber and bamboo, and in localities subject to inundation are raised on piles. The Siamese profess Buddhism, introduced into the country about the middle of the 7th century. Christianity is now making some progress in the country. Some of the temples are large and elaborate structures richly decorated. The language forms a connecting link between the Chinese and Malay. The written characters seem to be derived from a form of Sanskrit. The literature is meager, uninteresting, and in point of imagination and force of expression much below the Arabic, Persian, or Hindustani. The language of the chief Buddhist works is Pali. The printing press has been introduced in recent years, and many of the best Siamese works can now be had in a printed form.

Government.— The legislative power is exercised by the king in conjunction with a council of ministers. The royal revenue, estimated at $10,000,000 a year, is raised by the land tax, and by taxes on fruit trees, spirits, opium, gambling, customs, tin mines, edible birds' nests, and fisheries. There is a small standing army, officered to some extent by Europeans, and a general armament of the people, in the form of a militia. The navy consists of 22 vessels of over 100 tons. There are 41 provinces, each administered by a governor.

History.— Siam appears to have no place in history prior to A. D. 638, and the credible records go back only to 1350, the date of the foundation of Ayuthia, the old capital. The Portuguese established intercourse with Siam in 1511, but in the 17th century were gradually supplanted by the Dutch. English traders were in Siam very early in the 17th century, but in consequence of a massacre their factory at Ayuthia was abandoned in 1688. The French were expelled about the same time, and the trade was neglected till 1856, when Sir J. Bowring's treaty again opened up Siam to Europeans. The present king is Chulalongkorn I., who was born in 1853 and succeeded his father in 1868. Like his father he has had an education in English, and is alive to the advantages to be obtained by adopting European inventions and discoveries.

Siamang, in zoölogy, the *Hylobates syndactylus,* a gibbon from Sumatra and the Malay peninsula. It is larger than the rest of the genus (true gibbons), has abnormally long pectoral limbs, and the middle and index digits of the pelvic limbs are united for nearly the whole length. A laryngeal air sac is present. It can walk fairly well in the erect position, by balancing itself with its arms, or by placing them over the head, and is quiet and affectionate in captivity.

Siamese Twins, the best known example of two male individuals having their bodies connected inseparably from their birth, being joined by a thick fleshy ligament from the lower end of the breastbone of each, having the common navel on its lower border so that they stood in a sort of oblique position toward each other. Born in Siam in 1811, of a Chinese father and a Chino-Siamese mother, and named Eng ("right") and Chang ("left"), they were brought to the United States in 1829. They were on exhibition in Europe and America a number of times, and ultimately settled in North Carolina. They married two sisters and had large families of children, none of whom exhibited any malformation. Chang received a paralytic stroke in 1870, and three years later was affected with an inflammatory disease of the respiratory organs. He died unexpectedly, Jan. 17, 1874, while his brother was asleep, and Eng died a few hours afterward. The Siamese twins attracted great attention during their lifetime, particularly from physiologists and medical men, some of whom thought that the ligament connecting them might have been cut without causing the death of either.

Sibbaldia, in botany, formerly a genus of *Potentillæ,* now reduced to a sub-genus of *Potentilla.* Calyx in 10 alternately large and small segments; petals, 5 to 7, sometimes wanting; stamens, 4 to 10; achenes 4 to 10. *P.* (formerly *S.*) *procumbens* is well known. It is a small glaucous, hairy plant, with trifoliolate leaves and small yellow flowers, occurring abundantly on the Scotch mountains.

Siberia, a great division of the Russian dominions; occupies all North Asia, stretching uninterruptedly E. from the Ural Mountains to the Pacific Ocean, and S. from the Arctic Ocean to the Chinese dominions and Russian Central Asia; total area, 4,883,496 square miles; pop. (1909) 7,878,500. It is divided into the governor-general-ships of Western Siberia, Eastern Siberia, and the Amur region. A region of such vast extent has naturally a very diversified configuration; but generally speaking Siberia may be considered as a vast inclined plane sloping gradually from the Altai, Syan, and Yablonoi Mountains on the S. to the Arctic Ocean on the N. In the E. it is traversed in different directions by several mountain ranges, but elsewhere it is almost unbroken by any greater heights

than a few hills. It is drained chiefly by the Obi (2,120 miles), with its great tributary, the Irtish (2,520 miles), the Yenisei, and the Lena (3,000 miles), all of which pursue a N. course to the Arctic Ocean; and by the Amur (2,700 miles, 2,400 of which are navigable), which flows in an E. and N. E. direction to the Pacific. The principal lake is Lake Baikal in the S., 400 miles long, 20 to 53 broad, and 1,560 feet above sea-level. The chief islands are the New Siberia group in the Aretic Ocean, and the island of Sakhalin, off the mouth of the Amur, in the Sea of Okhotsk, an arm of the Pacific. The coast line is very extensive, but the Arctic Ocean is ice bound at least 10 months out of the 12, and is almost valueless for commercial purposes, and the Sea of Okhotsk, on the Pacific, is infested with masses of floating ice and dense fogs. The principal ports are Vladivostock, on the Sea of Japan, the chief naval station of Russia on the Pacific; Okhotsk, on the Sea of Okhotsk; and Petropavlovsk, on the E. coast of Kamchatka.

Siberia has a warm summer, but the winter is exceedingly severe. South Siberia has, in many parts, a very fertile soil, which yields rich crops of wheat, rye, oats, and potatoes; but immense tracts of Siberia are utterly unfit for tillage, more particularly the tundras, or great stretches of boggy country along the Aretic Ocean. In the W. are extensive steppes. Roughly speaking, the N. limits of agriculture are 60° N. latitude. Cattle breeding and bee keeping are largely pursued. Hunting and fishing are also sources of remuneration, ermines, sables, and other furbearing animals being numerous. The wild animals include the elk, reindeer, and other deer, bear, wolf, white and blue fox, lynx, etc. The forests are extensive and valuable. Manufactures and mining are in a backward state, though Siberia has very considerable mineral wealth. Large quantities of gold are obtained, as well as silver, platinum, lead, iron, coal, etc. The trade is mainly with Russia, which takes every year from Siberia about $20,000,000 worth of raw products, chiefly tallow, hides, furs, and grain; and sends every year to Siberia about $60,000,000 worth of manufactured wares. The foreign trade is insignificant. The chief towns are Irkutsk, capital of Eastern Siberia, a trading city; Tomsk, capital of Tomsk province, a trading city, with a university; and Tobolsk, capital of Western Siberia. Yermak the Cossack entered Western Siberia in 1580, and made a rapid conquest of the W. portion of the country, which he handed over to Ivan the Terrible of Russia. Bands of hunters and adventurers then poured across the Urals, attracted by the furs, and gradually penetrated to the Arctic Ocean and the Pacific. The latest acquisitions by Russia were the Amur territory and coast regions of Manchuria, ceded by China in 1858 and 1860. Exile to Siberia began soon after the conquest, and ever since Siberia has been a great penal colony. Hardened convicts and important political offenders are kept under close control, but the great majority of the exiles are simply placed in a particular district and allowed to shift for themselves. The Russian population of Siberia, which is more than three-fourths of the whole, consists mainly of exiles or the descendants of exiles. Valuable goldfields have been discovered in Yeniseisk, and in the basins of the Obi, Lena and Amur rivers, 50,000 men being employed in mining. In recent years thousands of Russian peasants have emigrated hither, and nearly all the fertile soil free of forest land outside the steppes has been occupied. A new sea route through the Kara Sea to Siberia has been opened up lately. The railway connection between Russia and Siberia forms the greatest railway scheme in the world. See RUSSIA: TRANS-SIBERIAN RAILWAY.

Siberia, Saxon. See SAXON SIBERIA.

Siberian Dog, a variety of the Eskimo dog, but of larger size and more docile temper. They do not stand so high as the pointer, but their thick hair, three or four inches long in the winter, gives them an appearance of greater stoutness. Under this hair is a coating of soft, fine wool, which begins to grow in the winter and drops off in the spring. Muzzle sharp, generally black; ears erect.

Siberian Railway. See TRANS-SIBERIAN RAILWAY.

Sibley, Henry Hastings, an American military officer; born in Detroit, Mich., Feb. 20, 1811. He was sent to Congress as a delegate from Wisconsin Territory in 1849, and represented Minnesota Territory in a similar capacity from the same year till 1853. He was elected the first governor of Minnesota in 1858; organized and led a military force against the Sioux Indians in 1862; and was commissioned a Brigadier-General of volunteers. He put an end to the Sioux war in 1863, and was brevetted Major-General. During the last 20 years of his life he took no active part in political issues, but identified himself with the educational interests of the State. He died in St. Paul, Minn., Feb. 18, 1891.

Sibley, Henry Hopkins, an American military officer; born in Natchitoches, La., May 25, 1816; was graduated at the United States Military Academy in 1838; served in the Mexican War and in Florida; took part in the notable military expedition to Utah; and was conspicuous in the campaign against the Navajo Indians. He entered the Confederate army in 1861 and attained

the rank of Brigadier-General. He went to Egypt after the war, and in 1869 entered the Egyptian army and as Brigadier-General served under the Khedive. In 1875 he returned to the United States, and died in Fredericksburg, Va., Aug. 23, 1886.

Sibley, John Langdon, an American librarian; born in Union, Me., Dec. 29, 1804; was graduated at Harvard College in 1825; appointed assistant librarian of Harvard Divinity School in 1825; engaged in literary work in 1833–1841; was assistant librarian of Harvard University in 1841–1856, and chief librarian in 1856–1877, when he was retired from active service and made librarian emeritus. He was a fellow of the American Academy of Arts and Sciences and of the Massachusetts Historical Society; founder of a charity fund of Phillips Exeter Academy; author of numerous biographical sketches, and editor of the "American Magazine of Useful Knowledge." He died in Cambridge, Mass., Dec. 9, 1885.

Siboney. See SPANISH-AMERICAN WAR.

Sibsaugor, the chief town of the district of the same name, in Assam, British India; about 11 miles S. of the left bank of the Brahmaputra; 46 miles S. E. of Luckimpur. In the neighborhood are many tanks and temples of the old native kings. The district of the same name, which lies between the river and the Naga Hills, has an area of 2,413 square miles. The tea plant grows here indigenously, but the tea manufacture did not flourish till 1852. In 1874 there were 22,573 acres under cultivation, yielding nearly 5,000,000 pounds of tea, or more than half the entire yield of the Assam valley; there were 92 Europeans and 24,000 natives employed, of whom the majority were imported from Crota Nagpur.

Sibyl, the name by which certain prophetic women were designated in ancient times. Their number is variously stated. Ælian mentions four — the Erythræan, the Simian, the Egyptian, and the Sardian; but it was popularly believed that there were 10 in all. Of these the most famous is the Cumæan, known by the names of Herophile, Demo, Phemonoë, Deiphobe, and Amalthæa. She was consulted by Æneas before his descent into the lower world, and accompanied him in his journey through the land of shadows. It was she who appeared before King Tarquin, offering him nine books for sale. The king refused to buy them, whereupon she went away, burnt three, and then returned, asking the original price for the remaining six. On his still refusing to purchase them, she again left, destroyed another three, and on her return offered to let him have the remaining three at the price which she had asked for the nine. Tarquin, astonished at such singular conduct, bought the books; and the sibyl vanished. On inspection they were found to contain directions as to the worship of the gods and the policy of the Romans. They were kept with great care in a stone chest in an underground chamber of the temple of Jupiter Capitolinus, at first by two commissioners, afterward by a college of 10, finally increased by Sulla to 15. These oracle keepers alone consulted them, by special order of the senate, in case of prodigies, dangers, and calamities.

In 83 B. C. the temple of Jupiter was burned and the original Sibylline books were destroyed. Ambassadors were accordingly sent to the different towns of Italy, Greece, and Asia Minor, to make a fresh collection. This was deposited in the temple when rebuilt. Spurious Sibylline books now began to accumulate and circulate in Rome. Augustus, fearing danger to the State from the abuse of them, ordered that all such should be delivered up to the prætor urbanus and burned. Over 2,000 were thus destroyed. Those that were accounted genuine were deposited in the temple of Apollo on the Palatine. The writing of these having become faded, Augustus commanded them to be rewritten. The Sibylline books were carefully examined at the instance of Tiberius, and many were rejected as spurious. In the conflagration of Rome in the reign of Nero they were all again destroyed. New collections were made, which were publicly and finally burnt by the Christian Emperor Honorius.

The Sibylline oracles to which Christian Fathers refer are in no sense whatever to be confounded with the older pagan collections. They are "pious frauds," belonging to early ecclesiastical literature, and are a curious mixture of Jewish and Christian material, with here and there, probably, a snatch from the older pagan source. The labors of Alexandre and Ewald have conclusively shown that their composition ranges from the 2d century B. C. to the 6th or 7th century A. D., the earlier poems being Jewish and Messianic, and the later ones distinctively Christian. An exhaustive collection of the Sibylline oracles was published by Gallæus (1689). Fragments have since been edited by Angelo Mai (1817) and Struve (1818).

Sicard, Montgomery, an American naval officer; born in Utica, N. Y., Sept. 30, 1836; was appointed to the navy in 1851; promoted master in 1858; lieutenant in 1860; and assigned to the Gulf blockading squadron in 1861. As executive officer of the "Oneida" he was present at the bombardment of Forts Jackson and St. Philip; engaged in the destruction of the Confederate flotilla in 1862; took part in the passage of the Vicksburg batteries, and com-

manded in the engagement with the ram "Arkansas." Later, as commander of the "Seneca," he participated in both attacks on Fort Fisher. After the war he served in various posts; was inspector of ordnance at the Boston navy yard in 1880–1882; chief of the Bureau of Ordnance in 1882–1890; commandant at the Brooklyn and Portsmouth navy yards; and in 1897 was appointed commander of the North Atlantic Squadron. At the outbreak of the American-Spanish War he was placed on the sick list, and the command given to Rear-Admiral Sampson; but after a partial recovery he was made president of the Board of Strategy. He died in Westernville, N. Y., Sept. 14, 1900.

Sicard, Roch-Ambroise Cucurron, a French educator; born in Toulouse, France, Sept. 20, 1742; entered into holy orders, and was sent by the Archbishop of Bordeaux to Paris to study the method of the Abbé de l'Epée for the instruction of deaf mutes. He became, in 1786, director of the school for deaf mutes established by the Archbishop of Bordeaux in the city of that name, whence, in 1789, he removed to Paris as successor to the Abbé de l'Epée, in whose system he made some important improvements. He also wrote several works on the instruction of deaf mutes. During the Revolution he narrowly escaped with his life; and under the Directory it was only by concealing himself that he was enabled to avoid the consequences of a sentence of exile pronounced against him. He died in Toulouse, May 10, 1822.

Sicca, an Indian weight of about 180 grains troy. The sicca rupee, formerly current in India, contained about 176 grains of pure silver, and was equal to about 50 cents.

Sicilian Vespers. Charles of Anjou, brother of Louis IX., King of France, having seized Sicily by virtue of a grant from Pope Alexander IV., the natives rose against the French the day after Easter, March 30, 1282. The massacre which ensued commenced at Palermo, extended to Messina and other parts of the island, and is known in history as the Sicilian Vespers.

Sicilies, The Two, a former kingdom of Italy, consisting of Naples (or S. Italy) and Sicily. In 1047, while Greeks and Saracens were struggling for the possession of Lower Italy and Sicily, the 12 sons of Tancred de Hauteville, a count in Lower Normandy, came in with their followers. Robert Guiscard, one of these brothers, subdued Apulia and Calabria, taking the title of duke, and his youngest brother, Count Roger, conquered Sicily. Roger's son and successor, Roger II., completed the conquest of all Lower Italy by subduing Capua, Amalfi, and Naples, at that time celebrated commercial republics, and in 1130 took the title of king, calling his kingdom the Kingdom of the Two Sicilies. In 1189 the race of Tancred became extinct, and the German emperor, Henry VI., of the house of Hohenstaufen, claimed the kingdom in right of his wife, Constantia, the daughter of Roger II. The kingdom remained with the family of Hohenstaufen till 1266, when Pope Urban IV., feudal overlord, bestowed it on Charles of Anjou, brother of Louis IX. of France, who caused the legitimate heir, Conradin of Suabia (1286), to be beheaded. Sicily, however, freed herself in 1282 from the oppressions of the French by the aid of King Pedro of Aragon, and Naples was now separated from it, Sicily being under the Kings of Aragon, while Naples was under the Angevin dynasty. This dynasty was dispossessed in 1442 by Philip V. of Aragon, who bestowed Naples on his natural son Ferdinand.

In 1504 Sicily was again united to Naples under the Spanish crown, and governed by viceroys till 1713, when the peace of Utrecht again divided the Two Sicilies, Naples falling to Archduke Charles of Austria, Sicily to Duke Victor Amadeus of Savoy. King Philip V. of Spain reconquered Sicily in 1718, at the instigation of Alberoni, but was forced to cede it to Austria in 1720, Savoy receiving Sardinia in exchange, by which means the Two Sicilies became a part of the Austrian dominions. In 1734 the Spanish Infante Don Carlos, son of Philip V., at the head of an army invaded Naples, conquered both the continental and the insular part of the kingdom, and was crowned at Palermo in 1735 as Charles IV. This change was sanctioned by the treaty of Vienna (1783), and till 1860 this line of the Bourbon family maintained possession of the Two Sicilies, except for a few years during the Napoleonic period, when Joseph Bonaparte and Joachim Murat reigned on the mainland as kings of Naples. In 1759, when Charles IV. ascended the Spanish throne under the name of Charles III., he conferred the Kingdom of the Two Sicilies on his third son Ferdinand, and decreed at the same time that it should never again be united to the Spanish monarchy. The reign of Ferdinand extended through the stormy period of the French revolution and the subsequent European commotions. His successors, Francis I., Ferdinand II. (Bomba), and Francis II. were despotic tyrants who forced the people into periodic revolt, put down with much severity. In 1860, however, an insurrection broke out in Sicily, and an expedition of volunteers from Piedmont and other Italian provinces under Garibaldi sailed from Genoa to the assistance of the insurgents. The result was that the Neapolitan troops

were driven from the island. Garibaldi, following up his success, crossed over to the mainland, where he met little or no opposition; Francis II. fled from Naples; the strong places in his hands were reduced; and by a popular vote the Kingdom of the Two Sicilies ceased to exist as such and became an integral part of the Kingdom of Italy. See ITALY.

Sicily, an island belonging to the kingdom of Italy, in the Mediterranean, the largest and the finest in that sea, lying at the S. W. extremity of Italy, from which it is parted by the narrow Strait of Messina. Area, 9,936 square miles; pop. (estimated 1906) 3,727,790. Sicily is of an irregularly triangular shape (hence its ancient Latin name of Trinacria), and is 180 miles in length by 120 in breadth. A mountain chain, seemingly a continuation of the Apennines, traverses the island E. and W., throwing off spurs, from one of which in the E. rises Mount Etna, the loftiest volcano in Europe, having a culmination of 10,900 feet; neither the lakes nor the rivers are of any considerable size or length. The plains and valleys which compose the greater portion of the island are remarkably fertile, and yield large crops of maize, wheat, rice, pulse, all kinds of vegetables, and abundance of fruits; the silk worm is largely cultivated. The minerals are marble, iron, copper, stone, agate, jasper, salt, and coal, while of sulphur the yield is enormous — above 150 mines, finding constant work for 12,000 men. The manufactures, generally unimportant, are silks, hats, furniture, skins, cotton, and cutlery; the exports comprise all native produce, with linseed, manna, rags, and tanned leather.

Sicily is divided into seven provinces — Palermo, Messina, Catania, Girgenti, Syracuse or Noto, Trapani, and Catanisetta. The Sicilians are of middle stature, well made, with dark eyes and coarse black hair; their features are better than their complexion; and they attain maturity and begin to decline earlier than the inhabitants of more N. regions. Their delivery is vehement, rapid, full of action, and their gesticulation violent; the latter is so significant as almost to possess the powers of speech, and animates them with a peculiar vivacity, bordering, however, rather on conceit than wit, on farce than humor. There is a great want of keeping and of comfort even in the best houses; and in them and everywhere there is a lack of cleanliness.

Sicily was originally peopled by the Phœnicians, by the Greeks, next by the Carthaginians, and then by the Romans. The Saracens in the 8th century subjugated the island, and some centuries later the Norwegians made inroads on its territory, and finally it fell under the Norman sway. From this time Sicily became the prey of Spain, France, and Austria, till the crown was united to that of Naples under the title of the Two Sicilies in 1734. When the French overran Italy under Bonaparte, the King of Naples, being driven from his throne, took shelter in this, the insular portion of his dominions, where he reigned in peace, under British protection, till the final peace of 1815 placed him once more in his continental chair of Naples. The revolution in Italy begun by Garibaldi in 1860 spread to Sicily, and on his landing the whole island rose, and the royal troops were beaten everywhere. When Naples acknowledged Victor Emmanuel as King of Italy, the Sicilian crown was laid with rejoicings at his feet. On Dec. 28, 1908 the Sicilian and Calabrian coasts were visited by an earthquake and tidal wave which caused a great loss of life and property.

Sickingen, Franz von, a German soldier; born in the castle of Sickingen, Baden, March 1, 1481; took a prominent part in the Lutheran reformation; and protected Reuchlin and Ulrich von Hutten and offered an asylum to Luther. In 1513 he declared war against the city of Worms, and subsequently fought against the Duke of Lorraine; levied large amounts of money on Metz and other cities; and laid siege to Mentz. He invaded Picardy with the Count of Nassau in 1521, but was forced by a stratagem of the Chevalier Bayard and by the sickness of his army to abandon the expedition. In 1522 he began a war with the Archbishop of Treves; raised an army of 12,000 men and desecrated his territories. He was besieged, however, in his castle near Kaiserslauten in 1523, and surrendered after being mortally wounded. He died in Germany, May 7, 1523.

Sickle, in husbandry, a reaping hook; a hooked blade, flattened in the plane of its curve and sharpened on its inner edge, used for cutting growing grain. One side of the blade is notched, so as always to sharpen with a serrated edge. In astronomy, a group of stars in the constellation Leo, resembling a sickle in form. The radiant point of the Leonids is within its area.

Sickle Bills, in ornithology: (1) a popular name for the genera *Drepanornis* and *Epimachus.* (2) *Eutoxeres,* a genus of humming birds, with three species, from Central America, remarkable for their strong and greatly arched bills. When approaching a flower, like other humming birds, in a direct line, they no sooner reach the calyx than they alter the position of their body in a downward direction, so that they appear to be suspended from the flower by the tip of the bill. The sexes are alike in plumage, which is rather plain.

Sickles, Daniel Edgar, an American military officer; born in New York city, Oct. 20, 1825. He studied law and was admitted to the bar in 1844; was elected to the State Legislature in 1847; became city attorney of New York, and was elected State Senator in 1855. In 1856 the Democratic party of New York elected him to Congress, where he remained till 1859. At the outbreak of the Civil War he organized the "Excelsior Brigade" of New York volunteers, and was commissioned one of its colonels. He was conspicuous for bravery and heroic endurance in the Peninsular campaign; was in the battles near Richmond, Va., in 1862, commanding a brigade; and led a division at the battle of Antietam, Sept. 17, the same year. He was in command of a corps at Chancellorsville, May 2 and 3, 1863, where he was severely wounded. For brilliant achievements at Fredericksburg he was promoted Major-General of volunteers. He commanded the 3d Army Corps at Gettysburg, July 2, 1863, and in this engagement lost a leg. He was assigned to the command of the 2d Military District, which included North and South Carolina, in April, 1867. In consequence of having supported the policy of Congress instead of that of President Johnson, he was removed, Aug. 26, 1867; and in 1869 was retired from the army. He was minister to Spain in 1869–1873, when he resigned, returned to New York city, and subsequently held several important civil posts, among them that of president of the Civil Service Commission. He was also a Democratic member of Congress in 1893–1897.

Sick Man, a term applied to Turkey on Jan. 15, 1854, by the Czar Nicholas, in a conversation with Sir Hamilton Seymour, the British ambassador at St. Petersburg. The czar intimated his opinion that Turkey was sick and dying. He therefore proposed that, to avoid a European war when the demise took place, Russia and Great Britain should come at once to a private arrangement as to the disposal of the Sick Man's effects. As France was ignored in the arrangement, there was some doubt as to the good faith of the czar. The British government rejected the proposal, intimated its belief in the recovery of the Sick Man, and soon after fought by his side in the Crimean War.

Sicyon. See POLYCLETUS.

Sicyon, a once celebrated city and small state of Greece, situated a few miles S. of Corinth, in the Morea. It was a chief seat of painting and statuary (tradition asserting that the former was invented there), it having given its name to a school of painting which included among its disciples Pamphilus and Apelles, both natives of Sicyon. It was also the native city of ARATUS (*q. v.*), the general of the Achæan League. There exists at the present day a few remains of the ancient city, as well as of the more modern buildings erected by the Roman conquerors of Greece, near which stands a small modern village named Vasilika.

Sida, in botany, the typical genus of *Sideæ*. Calyx cup-shaped, five-cleft, valvate; petals five; stamens and styles many, the former in a columnar tube, and latter more or less united at the base; capsule few or many celled, each cell with one roundish, flattened, suspended seed. It contains about 200 herbs and shrubs, from the warmer parts of the world. *S. rhombifolia, S. rhomboidea, S. cordifolia, S. carpinifolia, S. abutila, S. tiliæfolia,* etc., have delicate fibers ,which may be used as a substitute for hemp and flax. The last species is cultivated for this purpose in China. The roots of *S. cordifolia* and *S. acuta,* mixed with rice, are given in India in dysentery; that of *S. carpinifolia* is prescribed in intermittent fevers, stomach complaints, etc.; those of *S. lanceolata* and *S. spinosa* are also medicinal. The leaves of *S. acuta, S. retusa,* and *S. mauritania* are made into poultices, and the chewed leaves of *S. carpinifolia* are applied in Brazil to wasp stings.

Siddhártha ("he who has accomplished his aim"), the name said to have been given at birth to Gautama Buddha. This was his individual name, Gautama that of his family, and Buddha ("enlightened") a subsequent appellation. See BUDDHISM.

Siddons, Sarah, an English actress; born in Brecon, South Wales, July 5, 1755. She commenced her theatrical career when quite a child, and in her 19th year was married to William Siddons, an actor in her father's (Roger Kemble) company. In 1774 she met with the first recognition of her great powers as an actress at Cheltenham in consequence of her representation of Belvidera in "Venice Preserved." Her success at Cheltenham procured for her an engagement at Drury Lane, but her first appearance there was a comparative failure, and in 1777 she again went on circuit in the provinces. Her second appearance at Drury Lane took place Oct. 10, 1782, in the character of Isabella in the "Fatal Marriage." Her success was complete, and she was universally acknowledged to be the first tragic actress of the English stage. For 30 years she continued to astonish and enchant the lovers of the drama, and having acquired an ample fortune she took her leave of the stage in 1812. Her greatest characters were Queen Catharine in "Henry VIII." and Lady Macbeth. In her art she was a close and systematic student, while in private life she enjoyed the respct of all who

knew her. She died in London, June 8, 1831.

Siddons, Mrs. Scott, an English actress; born in India in 1844; the great-granddaughter of Sarah Siddons; was educated in Germany. As Lady Macbeth she made her first professional appearance in England, at Nottingham. She appeared in the United States first as a dramatic reader in New York city, and she made her début as a dramatic star at the Boston Museum about 1868.

Side Bones, enlargements situated above the quarters of a horse's feet, resulting from the conversion into bone of the elastic lateral cartilages. They occur mostly in heavy draught horses with upright pasterns, causing some stiffness, but, unless of rapid growth, little lameness, though they are accounted among the defects that render a horse "unsound." They are treated at first by cold applied continually till heat and tenderness are removed, when blistering or firing must be resorted to, and removal of pressure by shoeing with a "bar shoe."

Sidereal, of or pertaining to the stars; starry, astral; also measured or determined by the apparent motions of the stars; as, a sidereal day.

Sidereal Clock, a clock regulated to measure sidereal time, reckoned by sidereal days of 23 hours, 56 minutes, 4 seconds mean solar time, which are measured by the interval between two successive passages of any fixed star over the same meridian, and divided into 24 sidereal hours.

Sidereal Time, time measured by the apparent motion of the stars. A sidereal day is the time from the passage of a star across the meridian till its next passage, and is exactly the period of the revolution of the earth on its axis. It is the most constant unit of time which we possess. Its length is 23 hours 56 minutes 4.098 seconds. A sidereal year is the period in which the fixed stars apparently complete a revolution and come to the same point in the heavens, and is the exact period of the revolution of the earth round the sun. There are 366.-2563612 sidereal days in a sidereal year.

Siderite, in mineralogy, a species belonging to the rhombohedral group of carbonates. Forms mostly rhombohedral, frequently with curved faces, cleavage rhombohedral and perfect. Hardness, 3.5 to 4.5; sp. gr. 3.7 to 3.9; luster, vitreous to pearly; color, shades of gray, brown, and brownish-red, rarely white; fracture, uneven. Composition for pure varieties: Carbonic acid, 37.9; protoxide of iron, 62.1 = 100, which is equivalent to the formula, FeO,CO_2, but part of the iron is frequently replaced by manganese, magnesium, or calcium, giving rise to numerous varieties, which Dana divides as follows:

A. Ordinary: (1) Crystallized; (2) concretionary (sphærosiderite); (3) granular to compact massive; (4) oölitic; (5) earthy.

B. By replacing part of the iron: (1) Nearly pure; (2) containing 5 to 12 per cent. of protoxide of manganese, with a little magnesia and lime; (3) containing 17 to 18 per cent. of protoxide of manganese, having the formula, $2FeOCO_2 + MnOCO_2$; (4) containing 25 per cent. of protoxide of manganese, the oligonite, with formula, $1\frac{1}{2}FeOCO_2 + MnOCO_2$; (5) containing little manganese and much magnesia, with the formula, $4FeOCO_2 + MgOCO_2$; (6) a similar composition, with sp. gr. 3.616-3.660, the sideroplesite; (7) containing 20 per cent. of carbonate of lime, with formula, $8FeOCO_2 + 2MnOCO_2 + 3CaOCO_2$; and (8) including all other kinds. A widely distributed mineral, but only occasionally found in sufficient abundance to work as an iron ore, except as the principal constituent of clay ironstones.

Also the name given to those meteorites which consists wholly of iron.

Sideroconite, a variety of marble of a yellowish-brown color, owing to the inclusion of pulverulent hydrated sesquioxide of iron.

Siderography, the art or practice of engraving on steel; applied especially to a transfer process, in which the design is first engraved on steel blocks, which are afterward hardened, and the engraving transferred to steel rollers under heavy pressure, the rollers being afterward hardened and used as dies to impress the engraving upon the printing plates.

Siderolite, a name proposed for those meteorites which consist partly of iron and partly of stony matter.

Sideromancy, a species of divination performed by burning straws, etc., on red-hot iron. By observing their figures, bendings, sparklings, and burning, prognosties were obtained.

Sideroscope, an instrument for detecting minute degrees of magnetism in substances usually supposed to be non-magnetic — the name having reference to the hypothesis that the traces of magnetism so detected are due to the presence of atoms of iron.

Siderostat, an apparatus for observing the light of the stars. Its action and construction are similar to those of the heliostat.

Sideroxylon, in botany, iron wood, a genus of *Sapotaceæ,* containing from 30 tc 40 species from the tropics. They are evergreen trees, with axillary and lateral fascicles of flowers. The fruit of *S. tomentosum,* an Indian tree, is made into piekles

and curries. *S. dulcificum* is the miraculous berry of West Africa, the sweet fruit of which is taken to correct the acidity of any other article of food or drink.

Sidgwick, Henry, an English philosopher; born in Skipton, Yorkshire, May 31, 1838. He was Professor of Moral Philosophy at Cambridge, and has done much for the promotion of higher education of women, having assisted in the foundation of Newnham College. His valuable works include: "The Methods of Ethics" (1874); "The Principles of Political Economy" (1883), one of the most important works on the subject; "Outlines of the History of Ethics" (1886); "Elements of Politics" (1891); etc. He died Aug. 29, 1900.

Sidmouth, a watering place on the S. coast of Devonshire, England; 14 miles by road, E. S. E. of Exeter. It lies in a narrow valley at the mouth of the little Sid between the red sandstone cliffs of High Peak (513 feet) on the W. and Salcombe Hill (497) on the E. Its esplanade is protected by a sea wall (1838), 1,700 feet long; and its parish church (1259; almost rebuilt 1860) has a stained W. window inserted by Queen Victoria in memory of her father, the Duke of Kent, who died here in 1820. Sidmouth then was the favorite resort that it has once more become since the opening of the railway; its former prosperity as a port, which in Edward III.'s day sent two ships to the siege of Calais, passed away through the silting up of the harbor. The climate is mild, the rainfall the least in Devon, and the beach yields plenty of agates and chalcedonies. Pop. (1901) 4,201.

Sidney, or **Sydney, Algernon,** an English military officer; born in Penshurst, Kent, in 1622. He accompanied his father, the 2d Earl of Leicester, in his embassies to Denmark and France. He was also early trained to a military life, and served with some distinction in Ireland, where his father was lord lieutenant. In 1643 he returned to England and joined the Parliamentary forces. In 1644 he was lieutenant-colonel of a regiment of horse in Manchester's army, and was severely wounded at Marston Moor. In 1645 he was given the command of a cavalry regiment in Cromwell's division of Fairfax's army, and was returned to Parliament for Cardiff. He was nominated one of the commissioners to try Charles I., but took no part in the trial, though he approved of the sentence. He refused all concurrence in the government of Cromwell, retiring to Penshurst, but when the return of the Long Parliament in May, 1659, gave expectations of the establishment of a republic, he again took his seat and was nominated one of the council of state. He was soon after appointed a commissioner to mediate a peace between Denmark and Sweden, and while he was engaged in this embassy the Restoration took place. Conscious of the offense he had given the royal party he refused to return and remained an exile for 17 years. At length, in 1677, the influence of his friends procured him permission to return to England. After the death of Shaftesbury in 1682, he entered into the conferences held between Monmouth, Russell, Essex, Hampden, and others, and on the discovery of the

ALGERNON SIDNEY.

Rye House Plot he was arrested and sent to the Tower on a charge of high treason. He was tried before the notorious Chief-Justice Jeffreys, and his trial was conducted with a shameless absence of equity which has conferred on him all the glory of a martyr. He was executed on Tower Hill, Dec. 7, 1683. His "Discourses Concerning Government" were first printed in 1698.

Sidney, Sir Philip, an English poet; born in Penshurst, Kent, Nov. 9, 1554. He became a favorite with the queen, who in 1577 sent him on an embassy to Germany. In 1585 he married Frances, daughter of Sir Francis Walsingham, and the same year he received the honor of knighthood. In 1583 he went to the Netherlands with his uncle Dudley, Earl of Leicester, who commanded the forces sent to assist the Dutch against the Spaniards, and he was appointed governor of Flushing and general of horse, but at Zutphen he was mortally wounded. He was a man of versatile gifts, and made his mark in many ways. He was a soldier and statesman of great promise, and his contributions to literature, though not numerous were of great importance They include the "Arcadia" (1590), a romance in a medley of prose and verse in an Italian style then popular; "Astrophel and Stella" (1591), the first important body of sonnets in the English language; and the "Defense

of Poesy," first published in 1595 as an "Apologie for Poetrie." He died in Arnheim, Netherlands, Oct. 9, 1586.

Sidney Luska. See HARLAND, HENRY.

Sidon (Hebrew, Zidon), anciently a city of Phœnicia; on the E. coast of the Mediterranean; half way between Tyre and Beyrout. It soon rose, both by its exceptional position and the enterprising character of its inhabitants, to the first position among the cities of Phœnicia, so that the whole country is sometimes designated by the name Sidon, "The Great," "the Metropolis." The extensive commerce of Sidon is well known from ancient authorities. Its colonies extended over the coast of Asia Minor, the adjacent islands, Thrace and Eubœa, and even some parts of Sicily, Sardinia, Spain, Northern Africa, in fact, nearly the whole of the ancient world. The Sidonian manufactures of glass and linen, purple dye and perfumes, were sources of vast wealth. At length it surrendered to Shalmaneser, King of Assyria. But under Assyrian, Chaldean, and Persian domination it retained a kind of independence for its internal affairs, and under the Persians reached its highest prosperity. An unsuccessful revolt against Artaxerxes Ochus ended in its temporary ruin (351 B. C.). Speedily rebuilt and repeopled, it opened its gates to Alexander the Great (333 B. C.), and from that time forth it fell successively into the hands of Syrian, Greek, and Roman rulers. Through the Middle Ages little is heard of it, except that it was taken by the Crusaders. The present town of Saida has 10,000 inhabitants, of whom 7,000 are Mohammedans. In the neighborhood are numerous rock-cut burial places of the ancient Phœnicians, in which have been found the sarcophagus of Eshmunazar, King of Assyria, and others. The town was stormed by the allies under Napier in 1840.

Siebengebirge, a small mountain range of Germany, on the right bank of the Rhine, not far from Bonn. Seven mountains tower above the rest, of which the Drachenfels, close to the Rhine, and presenting a splendid view from the river, is the most beautiful. On all of them are ruins of ancient castles.

Siebold, Philipp Franz von, a German physician; born in Würzburg, Germany, Feb. 15, 1796; became sanitary officer to the Dutch in Batavia, and, accompanying the Dutch embassy to Japan, did much to make Japan known to the world. He spent 1826–1830 in Japan, wrote on the country, its flora, and language, and died Oct. 18, 1866. His brother KARL THEODOR ERNST VON SIEBOLD, a German anatomist; born Feb. 16, 1804; became famous as professor at Munich (1853). He wrote works on the Invertebrata, tapeworms, parthenogenesis, salamanders, and on the fresh-water fishes of Central Europe. He died April 7, 1885.

Siedlce, the chief town of the Russian province of the same name, in the former kingdom of Poland; 40 miles E. by S. of Warsaw. The seat of a Roman Catholic bishop, it has a fine palace, girt with beautiful gardens, and carries on important baking, distilling, and sugar-refining industries. The province lying between the Vistula and the Bug nearly corresponds to the old palatinate of Polachia, area, 5,534 square miles; pop. province (1897) 775,316.

Siege, literally a sitting down. When the assault of a fortified place would be too hazardous and costly and its reduction by blockade too slow, recourse is had to the "regular siege or systematic attack." In order to cross the open ground swept by the fire of the fortress with as little loss as possible the besieger makes use of sunken roads or trenches. The revetments having been breached by his artillery or mines, he continues these roads through the breaches into the place. To prevent these "approaches" being enfiladed by the guns of the fortress, they are made at first in zigzags, the prolongations of which are directed so as to clear the works of the fronts attacked; and, when a direct advance becomes necessary, they are provided with traverses at short intervals, or "blinded sap" is used—*i. e.*, a trench covered in with timber and earth. Two or three such lines of approach are used. To protect and connect them lateral trenches are formed, from which large bodies of troops can fire upon any sortie that may be made. These are termed "parallels," being parallel to the general front of the parts attacked. The first parallel is made at as short a distance as possible from the fortress, and its construction follows the disorganization of the defenders' artillery by that of the attack from its first position, often 4,000 or more yards from the fortress; the second would be rather less than midway between the first and the most advanced works of the fortress, so that the supporting troops in it may be nearer the working parties in the approaches than the enemy; the third parallel would generally be about 100 yards in front of the salients of the covered way. Parallels are useful also to connect the batteries which, dispersed over a wide area, will concentrate their fire on the revetments of the ditch and ramparts, or on the guns of the defense. These latter, restricted as they are to a comparatively small space, must eventually be outnumbered and overpowered; but if the investment is imperfect, as at the siege of Sebastopol in 1854-1855, an active defender may long delay this disaster, especially if the fortress has an outer girdle of detached forts, for in that case at least two

of the forts must be taken by regular siege before further advance is made, and the ground between them (1,000 yards and upward) lends itself to the construction of new batteries to meet those of the attack. But the resources in men, guns, and ammunition must, by the nature of the case, be largely in favor of the attacker, and therefore, if persevered in, the siege is sure to succeed. The siege of Port Arthur by the Japanese in 1904-05 is the most recent example of a modern siege. The land operations may be said to have commenced in May. The Japanese attempted to capture the outlying works by numerous assaults, costing them dearly in lives. They did not make much headway until they commenced regular siege operations, as above indicated, in September, 1904. (See RUSSO-JAPANESE WAR.)

The ancients used to surround the place attacked with a high bank of earth, called a "line of circumvallation" and protected themselves against attack from the outside by another, called a "line of contravallation," and a similar arrangement was in vogue till the middle of the 19th century. Now a covering field army is employed, which, by its greater mobility, is able to meet the relieving army many miles from the besieging force, and a chain of fortified localities takes the place of the continuous line of circumvallation. In order that a siege may be safely undertaken, the strength of the besieger should be about four times that of the garrison. Thus, in the case of a small place with a garrison of 5,000 men, the line of investment would probably be 12 miles long, and could be maintained by three detachments of 2,500 men each, the guards of the trenches would be 5,000 and working parties 8,000—a total of 20,500. In 1870 Strassburg, with a garrison of 20,000, was captured by a besieging force of 60,000 strong. Metz was starved into surrender, the presence of so many men (some 170,000) besides the proper garrison only hastening that result. Had this large entrenched camp been held by its regular garrison of 40,000 men it would not have fallen to a besieger with less than 120,000, which is more than half the number actually employed. The "siege trains" used by the Germans were comparatively small, owing to the badly prepared state of the French fortresses. Thus, at Strassburg only 243 pieces were used, firing 200,000 rounds in 36 days, while at Sebastopol the allies mounted 698 pieces of artillery, and in three days these fired 150,000 rounds.

The "siege parks," or main depots for the artillery and engineer trains, must be out of range of the enemy's guns, containing as they do powder, ammunition, guns, and warlike stores of all descriptions. The batteries necessary are "enfilade" batteries, placed on the prolongations of all the important works attacked; "counter" batteries, to overcome the fire of the works bearing upon the field of attack; "mortar" and "howitzer" batteries, to search by high angle fire the interior of all the works attacked; and "breaching" batteries, to reach by curved fire the scarps and flanking casements. Light pieces, such as mountain guns and machine guns, are placed in the second and third parallels, and in the "demi-parallels" or lodgments, 100 to 150 yards long, made on each approach about halfway between these parallels.

Beyond the third parallel the besieger will probably be met by counter mines, and himself have to resort to mining in order to carry out the crowning of the covered way. He will then connect his approaches by a fourth parallel, establish batteries and lodgments on the crest of the covered way, and from them mine down to the back of the counterscarp, which he can blow in previous to sapping across the ditch and up the breaches. From the positions thus gained a further advance, if necessary, can be made till the last retrenchment is taken, and the place falls.

Siege in History.—Among great sieges in the world's history may be mentioned those of Troy, Tyre (585-572 B. C.; 332 B. C.), Syracuse (415-413 B. C.), Saguntum (219 B. C.), Carthage (147-146 B. C.), Jerusalem (69-70 A. D.), Acre (1189-1191), Calais (1347), Orléans (1428-1429), Constantinople (1453), Rome (1527), Haarlem (1572-1573), Leyden (1573-1574), Breda (1625), La Rochelle (1627-1628), Magdeburg (1631), Breisach (1638), Taunton (1644-1645), Londonderry (1689), Gibraltar (1727; 1779-1783), Prague (1741; 1744), Quebec (1759), Seringapatam (1799), Genoa (1800), Saragossa (1808-1809), Ciudad Rodrigo (1810; 1812), Antwerp (1832), Sebastopol (1854-1855), Kars (1855), Lucknow (1857), Delhi (1857), Gaeta (1860-1861), Vicksburg (1863), Charleston (1863-1865), Richmond (1862-1865), Metz (1870), Strassburg (1870), Belfort (1870-1871), Paris (1870-1871), Plevna (1877), Khartum (1884-1885), Ladysmith (1899-1900), and Port Arthur (1904-1905). See also FORTIFICATION; GUN; MACHINE GUN; MORTAR; PROJECTILES, THEORY OF.

E. L. ZALINSKI.

Siege, State of. The "state of siege" as defined by continental jurists is a condition of things in which civil law is suspended or made subordinate to military law. No such provision is made by the laws of the British empire or of the United States, though very similar powers are exercised when martial law is proclaimed.

Siege Gun, a cannon sufficiently light to be transported conveniently, and throwing projectiles adapted for breaching fortifications in sieges. It is mounted on a siege

carriage, and forms part of a train of an army. Siege gun carriages differ from those of ordinary field pieces in being stronger and heavier. The limber has no ammunition chest, the ammunition and implements being transported in wagons accompanying the train.

Siegen, a town of Prussia, in Westphalia, on the Sieg river; 47 miles E. of Cologne; manufactures leather, paper, linen, soap, iron, copper, lead, zinc, etc., having many mines in the vicinity. Siegen was the birthplace of Rubens.

Siemens, Sir Charles William, a German engineer; born in Hanover, April 4, 1823; was educated at the gymnasium at Lübeck, the polytechnic school at Magdeburg, and the University of Göttingen. After a training in engineering and electricity in the workshops of Count Stolberg he migrated to London in 1843, and at a later date was joined by his brother (Werner), who joined with him in his various undertakings. The great works of Siemens Brothers at Charlton, West Woolwich, for the manufacture of submarine electric telegraph cables, were established in 1858; and the great steel works at Landore, Swansea, in 1868. He labored mainly in two distinct fields, the applications of heat and the applications of electricity, and won a great reputation in both. He was knighted, April 1883, in recognition of his services, which had been previously recognized by numerous scientific societies, and by the Universities of Oxford, Glasgow, Dublin, and Würzburg. He died in London, Nov. 19, 1883.

Siemens, Werner von, a German engineer and electrician; born in Leuthe, Hanover, Dec. 13, 1816. In 1834 he entered the Prussian artillery, and in 1844 was put in charge of the artillery workshops at Berlin. He early showed scientific tastes, and in 1841 took out his first patent for galvanic silver and gold plating. He was of peculiar service in developing the telegraphic system in Prussia, and discovered in this connection the valuable insulating property of gutta-percha for underground and submarine cables. In 1849 he left the army, and shortly after the service of the State altogether, and devoted his energies to the construction of telegraphic and electrical apparatus of all kinds. The well-known firm of Siemens and Halske was established in 1847 in Berlin; and subsequently branches were formed, chiefly under the management of the younger brothers of Werner Siemens, in St. Petersburg (1857), in London (1858), in Vienna (1858), and in Tiflis (1863). Besides devising numerous useful forms of galvanometers and other electrical instruments of precision, Werner Siemens was one of the discoverers of the principle of the self-acting dynamo. He also made valuable determinations of the electrical resistance of different substances the resistance of a column of mercury one meter long and one square millimeter cross section at 0°C. being known as the Siemens unit. His numerous scientific and technical papers, published in the "Proceedings" of the Berlin Academy (of which he became a member in 1874), in Poggendorff's "Annalen," in Dingler's "Polytechnische Journal," etc., were republished in collected form in 1881. In 1886 he gave 500,000 marks for the founding of an imperial institute of technology and physics; and in 1888 he was ennobled. He died in Berlin, Dec. 6, 1892.

Siena, or **Sienna,** a city of Central Italy, on three connecting hills on the S. frontiers of Tuscany, 59 miles S. of Florence, is surrounded by old walls, entered by nine gates, and has also a citadel; the streets are irregular, steep and narrow. It has a university with faculties of law and medicine, and a cathedral, begun in the early years of the 13th century, which is one of the finest examples of Italian Gothic architecture. The municipal palace, begun in 1288, is a fine specimen of Pointed Gothic. It stands in the historic Piazza del Campo, now the Piazza di Vittorio Emmanuele, a large open semicircular space in the center of the city, and is adorned with frescoes of the Sienese school. The institute of fine arts contains a valuable collection of pictures of the older Sienese painters. There are various other buildings of interest, including churches and palaces. The manufactures are not of much importance. In the Middle Ages Siena gave its name to a school of painting, and was the birthplace of famous painters, sculptors, and architects. It was long the powerful rival of Florence, but was annexed to Tuscany in 1557. Siena is the seat of an archbishop. Pop. (1901) 38,665.

Sienkiewicz, Henry, a Polish author; born in Lithuania in 1845. He is the author of the historical novel "Quo Vadis" and "Sword and Fire." He designed the latter as the beginning of a cycle of books, and it was his intention to complete the cycle, but he got no further than the third when his wife died. She was the inspiration of the design, and her death had the effect of temporarily discouraging the author from the working out of his system. The books that followed "Sword and Fire" were "The Deluge" and "Ian Wolovyjswki." Later works were: "Children of the Soil"; "Knights of the Cross"; "Let us Follow Him"; etc.

Sienna, or **Sienna Earth,** a ferruginous ochreous earth, which when raw is of a fine yellow color, and when burned assumes a

rich orange-red tint. It is used as a pigment in both oil and water-color painting.

Sierra, a chain of hills or mass of mountains with jagged or saw-like ridges.

Sierra Leone, a small British colony on the W. coast of Africa, consisting of a peninsula, 18 miles long and 12 broad, on the coast of Senegambia. It consists generally of one vast, almost impenetrable forest, only particular spots of which have been cleared and cultivated. Sierra Leone was purchased by Great Britain in 1787 from the native chiefs, for the purpose of a settlement for liberated negroes, and to aid in the suppression of the slave trade. Capital, Free Town. Pop. (1901) 76,655.

Sierra Madre ("Main Chain"), a general name for the mountains that in Mexico stretch N. from about Guadalajara to Arizona, forming the W. wall of the plateau, and separating Chihuahua from the maritime States of Sinaloa and Sonora. Along the E. foothills of the range, in Northwest Chihuahua, the country is very fertile. The so-called Sierra Madre plateau, on the United States frontier, is a continuation of the Chihuahua plateau. The name has often been more widely extended, however, to include the central and E. ranges of the Cordilleras.

Sierra Morena, a chain of mountains in Spain, between New Castile and Andalusia,

SIENA CATHEDRAL.

separating the Guadiana on the N. and the Guadalquivir on the S., and attaining a height of 5,500 feet above sea-level.

Sierra Nevada, a chain of mountains in Southern Spain, the most elevated in the peninsula. The greater part of it is in the province of Granada, running E. and W., and the highest peak in Mulahacen, which has an elevation of about 11,678 feet, and is capped with everlasting snow. The range is rich in fertile valleys and picturesque scenery.

Sierra Nevada, a mountain range of California, extending N. and S. along the E. boundary of the State. It consists of an aggregate of ranges, on an average some 70 miles wide, with numerous peaks reaching an elevation of 10,000 and 15,000 feet. Gold mining, timber cutting, and sheep rearing are important industries in these ranges.

Siesta, the name given to the practice indulged in by the Spaniards, and the inhabitants of hot climates generally, of sleeping two or three hours in the middle of the day, when the heat is too oppressive to admit of their going from home.

Sieyès, Emmanuel Joseph, better known as the ABBÉ SIEYÈS, a French revolutionist; born in Fréjus, France, May 3,

EMMANUEL SIEYÈS.

1748, and pursued his studies for the Church at Paris. He was active in furthering the progress of the Revolution, and soon acquired great influence in the National Assembly. He originated the idea of the new geographical division of France into departments, arrondissements, and communes. In 1791 he became a member for the Seine department, and in 1792 deputy for the department of Sarthe. During the Reign of Terror he withdrew into the country, but after Robespierre's downfall he returned to the convention and took an active part in affairs. In 1799, on his return from a mission to Berlin, by which he secured the neutrality of Prussia, he became a member of the directory. He subsequently suppressed the Jacobin Club, and was active in bringing about the overthrow of the directory and the substitution of the consular government by the revolution of the 18th Brumaire, the new constitution being devised by him. Sieyès soon found his speculations completely overmatched by Bonaparte's practical energy, and though a consul provisionally, he saw it desirable to terminate his political career. He retired with the title of count, and obtained grants of land and property to the value of at least $250,000. He was exiled at the restoration, but returned on the July revolution of 1830, and died in Paris, June 20, 1836.

Sif, in Scandinavian mythology, wife of Thor, famous for the beauty of her hair. Loki, having cut it off while she was asleep, she obtained from the dwarfs a new fell of golden hair equal to that which he had taken.

Sigalion, in zoölogy, a genus of *Aphroditidæ,* with cirri on all the feet. *S. boa,* the boa-shaped sigalion, is a worm about eight inches long and a quarter of an inch broad, with numerous feet and horny jaws. It lives near low-water mark in the British and Mediterranean Seas.

Sigaretus, in zoölogy, a genus of *Naticidæ;* shell striated, ear-shaped; spire minute; aperture very wide, oblique, not pearly; operculum minute, horny, subspiral. Recent species 31, from the West Indies, India, China, and Peru; fossil 10, from the Eocene onward.

Sigel, Franz, an American military officer; born in Sinsheim, Baden, Nov. 18, 1824; was graduated at the military school at Carlsruhe in 1843 and commissioned a lieutenant in the army. When the Baden revolution began he raised troops; assumed the leadership of the insurrection; and was made Secretary of War and Commander-in-Chief of the army. He came to the United States in 1852, and when the Civil War broke out, organized a regiment and went to the front, where he served with unusual distinction, being promoted Major-General. Subsequently he settled in New York city, where he entered politics; was made collector of internal revenue in May, 1871; register of the city in October, 1871, and pension agent in 1886; later was editor and publisher of the "New York Monthly." He died Aug. 21, 1902.

Sighing, a respiratory act, often prompted by mental impressions of conscious or unconscious kind, which is commenced by a prolonged effort of inspiration, in which the diaphragm descends. The expiratory act which follows, and which constitutes the "sigh," is caused by the recoil of the chest walls and lungs,

and by the action of the abdominal muscles. Sighing, in short, illustrates simple respiration as modified by mental conditions. In the "breathless attention" of a person listening to a speaker, or witnessing some exciting scene, the respirations become very short and quickly recurring, with an occasional long sigh inspiration at intervals.

Sighs, Bridge of. See BRIDGE OF SIGHS.

Sight, in physiology, one of the five human senses, having for its organ the EYE (*q. v.*). In this organ, then, we have the retina, an expansion of the optic nerve, to receive and transmit to the brain the impressions of light; certain refracting media for so disposing the rays of light traversing them as to throw a correct image of an external body on the retina; and a contracting diaphragm, with central apertures for regulating the quantity of light admitted into the eye. When the eye is directed to any object, an image of that object is depicted on the back of the eye by means of the rays of light entering the pupil, and duly refracted by the different humors. The image, which is inverted, produces, somehow, an impression on the retina with the assistance of the choroid coat, and this impression passes inward to the nervous centers, whence the optic nerve takes its rise. No satisfactory explanation has yet been given to account for the fact that we see objects erect the images of which are presented to us inverted on the retina. According to Müller, the mind really perceives the objects inverted; but as this inversion is uniform, it is not perceived. The subject of binocular vision, or that with two eyes we only perceive one object, was long a perplexing subject to philosophers, till it was satisfactorily explained by means of that now well-known instrument the STEREOSCOPE (*q. v.*).

The power of adapting the eye to vision at different distances has received the most varied explanations; but the opinion now generally entertained is that it depends mainly on some alteration, either in position or form, which takes place in the crystalline lens. Some persons possess this power of adaptation in a very slight degree, and thus labor under defective vision, of which there are two kinds, the person in the one case only seeing distinctly those objects which are near, in the other, only such as are distant. Nearsightedness is caused by anything — such as undue convexity of the cornea — which increases the refracting power of the eye, and so causes the image of an object to be formed at a point anterior to the retina, and is remedied by the use of concave glasses. Long-sightedness, on the other hand, is owing to conditions the reverse of this, and is remedied by the use of convex glasses, which diminish the focal distance of an image formed in the eye. In order to distinctness of vision, the following conditions are necessary: (1) A sufficiency of light or illumination in the object viewed. (2) The formation of the image exactly on the retina, and not either before or behind. (3) The minute size of the ultimate divisions of the retina capable of independent sensation. The great superiority of the eye as a medium for perceiving the outer world lies in this power of independent sensibility to minute points. We judge of the motion of an object partly from the motion of its image over the surface of the retina, and partly from the motion of our eyes following it; and of the form of bodies, partly from the mere sensation, and partly from the association of ideas. There is none of the senses capable of affording so large an amount of instruction and delight as the eye; none in which the judgment has to play so important a part; and none so susceptible of education.

In law, bills of exchange are frequently drawn payable "at sight" (*i. e.* on presentation), or a certain number of days "after sight." In the last case the time begins to run from the period of presentment and acceptance. "Sight draft" and "Sight bill" are bills payable at sight.

Sight, Defects of, conditions usually caused by anomalies in the shape of the eye. The normal eye is an optical apparatus so constructed that the images of distant objects are thrown with sharpness on the retina; if this is not the case the objects are not seen distinctly. There are two very common instances of defective eyesight, short sight or myopia and long sight or hypermetropia, the one being the reverse of the other. In the former case, owing to the too great power of the crystalline lens, or to the eye cavity extending too far backward, images from objects at some distance are formed in front of the retina. The sight of the myope is thus confused or absolutely defective for objects beyond a certain short range, but on the other hand it is very clear for near objects. The remedy for myopia is the employment of biconcave glasses, which, if the myopia is not considerable, need only be used for looking at distant objects. In the case of hypermetropia objects are seen distinctly only at a range beyond that belonging to normal vision. Owing to the shortness of the eye cavity the lenses in this case are unable to converge the rays to a focus within the limits of the eye chamber, the image being therefore formed (theoretically) behind the eye. This defect is corrected by the use of convex lenses, which, by converging the rays of light, cause the image to fall on the retina. Both these defects are usually congenital.

A similar defect to hypermetropia is that of presbyopia (Greek *presbys*, old), which

usually comes on with advancing years, and is due to diminished focussing power and lessened elasticity of the lens, the result being that the image of a near object is not clearly formed on the retina but behind it, while distant objects are seen as well as ever. The remedy in this case also is convex lenses. Astigmatism is a defect usually characterized by asymmetry in the curvature of the cornea in different meridians. (See ASTIGMATISM.) Opacities in the cornea or crystalline lens, etc., are also not uncommon causes of defective eyesight. Double vision is when, as in some cases of squinting, each eye sees things separately; or it may result from muscular paralysis. Night blindness or hemeralopia is a peculiar defect by which a person becomes suddenly and entirely blind when night comes on, though he can see perfectly well in the daytime. See EYE.

Sigillaria, the type genus of *Sigillarieæ* or any individual of the genus. The trunk is arborescent, cylindrical, unjointed, and unbranched, except toward the apex, where in some species it parts dichotomously. The height is from 30 to 60 or 70 feet; the diameter of the stem from one to five. Its interior being largely cellular, speedily decays, for most of the prostrate stems are flattened, the outer parts being now generally coal without vegetable structure, and the inner portion is replaced by the inorganic rock. The stem is deeply fluted with oblong, discoid, or nearly rounded leaf scars, with three vascular marks in their center. The arrangement is not distinctly spiral. The long, narrow, rigid, two or three-nerved leaves, at first called from their sedge-like appearance cyperites, are their leaves. Stigmaria has been proved to constitute the roots, the two having been seen actually united. Principal Dawson believes that sigillaria had medullary rays, Mr. Carruthers is of a contrary opinion. The former palæobotanist believes *trigonocarpum* to have been their fruit, the latter regards the fruit as having been a cone or strobilus. Brongniart ultimately classified them with arborescent ferns; Corda thought them akin to *Euphorbiaceæ;* Principal Dawson places them among gymnosperms near the cycads, or intermediate between these and the higher acrogens; Sir Joseph Hooker deems them cryptogams; Mr. Carruthers, concurring in this view, ranks them among the lycopods. A species is recorded from the Upper Silurian, they occur in the Devonian, and reach their maximum in the Carboniferous.

Sigismund, Emperor of Germany and King of Hungary and Bohemia, second son of the Emperor Charles IV.; born in 1361. On the death of his father, in 1378, he became Margrave of Brandenburg, and was occupied four years in visiting his States, and receiving their homage. He married, in 1386, Maria, daughter of Ludwig Louis, King of Hungary, and was crowned king the same year. He soon after extended his dominions by the conquest of the Wallachia. His queen dying in 1392, his claim to the crown of Hungary was contested by Ladislaus V., King of Poland, but unsuccessfully; and the frequent conspiracies formed against Sigismund by the nobles made him suspicious and cruel. Alarmed by the conquests of the Turks, he sought aid of France and England; and a great battle was fought at Nicopolis in 1396, in which the French, under the Count of Nevers, were defeated and almost all slain, the Hungarians fled without fighting, and Sigismund narrowly escaped and led a wandering life for 18 months. In 1410 he was chosen emperor by one party of the electors, Jobst, Marquis of Moravia, being chosen by another party, and Wenceslaus, who had been deposed, still retaining the title of emperor. At the same period there were also three rival Popes.

But the death of Jobst and the acquiescence of Wenceslaus left Sigismund without a rival in the following year. He was crowned at Aix-la-Chapelle in November, 1414, and went thence to the great Council of Constance. He surrounded the town with his troops, and remained master of its gates during the council. The Bohemian reformer, John Huss, had come to Constance under a safe conduct of the emperor; but he was nevertheless burnt, as was also his disciple, Jerome of Prague. Sigismund had a conference with the Pope, Benedict XIII., at Perpignan, hoping to induce him to resign the tiara, but he failed. About the same time he sold Brandenburg to Frederick of Hohenzollern, Burgrave of Nuremberg; raised Savoy into a duchy for Amadeus VIII., and visited France and England. He professed to negotiate a peace between Charles VI. and Henry V., but perfidiously made a secret alliance with the latter, hoping to recover Arles. By the death of his brother, Wenceslaus, in 1419, he succeeded to the crown of Bohemia, and the Hussite war began, which lasted 15 years. The famous Zisca defeated Sigismund before Prague in 1420, but agreed to a truce, and Sigismund was crowned soon after. After the death of Zisca the war was ably carried on by the two leaders, named Procopius the Great and Procopius the Less. In 1431, Sigismund was crowned King of Italy at Milan; and in 1433, Emperor of Rome by Eugenius IV. He died Dec. 9, 1437.

Sigismund I., King of Poland, called THE GREAT, son of Casimir IV; born Jan. 1, 1467; and succeeded his brother, Alexander, in 1507. He died April 1, 1548.

Sigismund II., surnamed AUGUSTUS; born Aug. 1, 1520, was son of the preceding,

and succeeded him in 1548. He died in 1572.

Sigismund III., surnamed De Vasa; born in 1566, was son of John III., King of Sweden, and of Catharine, the daughter of Sigismund I. He was elected King of Poland in 1587, and succeeded to the crown of Sweden in 1594. Being a Catholic, his uncle, Charles, Duke of Sudermania, easily undermined his authority in Sweden, and he lost that kingdom in 1604. In 1610 he succeeded in placing his son, Vladislaus, on the throne of Russia, but was afterward obliged to succumb, and besides that, was involved in a war with Gustavus Adolphus. He died in Warsaw in 1632.

Sign, in astronomy, a portion of the ecliptic or zodiac, containing 30 degrees, or a 12th part of the complete circle. The first commences at the point of the equator through which the sun passes at the time of the vernal equinox; and they are counted onward, proceeding from W. to E., according to the annual course of the sun, all round the circle. The names of the 12 signs, in the order in which they follow each other, are as follows: Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces. It is to be remarked that the above are also the names of the 12 constellations of the zodiac; and in ancient times (more than 200 years before our era), the places of the signs and the constellations were coincident; but owing to the motion of the earth's equator, by which the equinoctial points are carried backward on the ecliptic about 50′ 6″ annually, the intersections of the ecliptic and equator, and consequently the commencement of the signs, now correspond to different stars, the first point of the sign Aries being at present near the beginning of the constellation Pisces. On this account care must be taken not to confound the signs of the zodiac, which are fixed in respect of the equinoxes, with the constellations, which are movable in respect of those points.

In algebra, a symbol indicating an operation to be performed, or a relation subsisting between two quantities. Of the former kind, those most commonly used are, + for addition, — for subtraction, × for multiplication, ÷ for division, $\surd$ for the square root $\sqrt[3]{}$ for the cube root, $\sqrt[n]{}$ for the nth root, etc. The sign denoting relations are, = equal to, > greater than, < less than, etc.

Signal Corps, in the United States army, a body of men specially trained in the methods of conveying information. The means employed include the telephone, telegraph, balloon, sight and sound demonstrations, and other methods of transmitting intelligence with promptness and in the briefest possible time. In the American-Spanish War the Signal Corps had comparatively little popular appreciation; yet a large share of the successful movements of the army and navy depended on the accuracy and fidelity of its officers and men. When the war broke out, Gen. A. W. Greely, the chief signal officer, had a thoroughly trained corps of 60 officers and men. This force was at once increased to 1,300 officers and men. The exposed harbors of the country were provided with such means of communication that the entire system could be controlled by a single official word. General Greely also established "electrical installations" for shore batteries, which made it possible for the range officer, located at a long distance from a battery, to promptly determine and report the exact position of the enemy's ships. He also provided balloon and telephone systems, and various combinations, till a perfect net of signal service connecting sea coast defenses, army posts, and positions which were occupied or might be occupied was woven over the country, over the sea, and over Cuba itself. In recruiting for this corps it was a condition that two-thirds of the force, officers and men, should be skilled electricians or telegraphers. As far as could be done, experienced Signal Corps officers were placed in command, and most of the other offices were given to non-commissioned Signal Corps officers who had been trained with regular line officers.

In the Santiago campaign the Signal Corps rendered its greatest service. General Greely claims that Col. James Allen first discovered the position of Cervera's squadron, a report later verified by Lieut.-Col. Joseph E. Maxfield, both of whom were Signal Corps officers. When the Spanish fleet sailed into Santiago harbor, May 19, Colonel Allen, then in charge of the end of the Havana cable at Key West, was receiving reports telegraphed in cipher from Cuba by secret agents to General Greely. The great dispatch that day was, "Five Spanish vessels arrived at Santiago de Cuba. Have notified Admiral Commanding Sampson. The Spanish flag-ship arrived at Santiago de Cuba. The admiral, Cervera, hastily wired Madrid." This dispatch and a later one was taken to President McKinley by General Greely, and then to Secretary Long, with the result that orders were issued to Admiral Sampson which culminated in the blockade of Santiago harbor, and the invasion of Santiago province by General Shafter.

Every day Colonel Allen furnished reports concerning the Spanish fleet. The navy, however, was not able to verify the reports of the Signal Corps, whereupon General Greely was informed that preparations for the campaign were being conducted

on his representations and that an independent verification of the situation was emphatically desirable. Then Lieutenant-Colonel Maxfield, in charge of the New York telegraphic censorship, independently confirmed the situation within 24 hours. General Greely says in his report, "It is an interesting anti-climax that when Cervera's squadron was destroyed, July 3, Colonel Allen, the same officer who originally reported the arrival of the fleet on the very day it reached Santiago, likewise first reported by telegraph the fact that the entire fleet had been destroyed, conveying the information to the President and to the country 14 hours in advance of any other official advice."

Through the operations of the Signal Corps General Shafter was placed in direct communication by telegraph and telephone with his subordinate officers, and was enabled to communicate with President McKinley in 20 minutes. The Signal Corps also obtained important information of the enemy's outworks at Santiago by sending up scouts in a balloon. They carried with them a telegraph instrument and wire which was connected with headquarters. After several ascensions the balloon was destroyed by a Spanish sharpshooter. Among the many officers who were prominent in the Signal service were Col. H. H. C. Dunwoody, Lieut.-Col. Richard E. Thompson, of Manila fame, Captain McKenna, and Lieut-Col. W. A. Glassford, who covered nearly half of Cuba with a military telegraph system about 170 miles long, much of the work being done under Spanish fire.

Signals, the means by which communications are made to greater distances than can be reached by the human voice. To the eye these are conveyed by flags, lights, etc., and to the ear by guns, steam-whistles, fog-horns, etc. The most complete systems of signaling are those devised to enable ships some distance apart to communicate with each other. Of these the most important ones in the United States navy are the international code, the secret naval code, the wig-wag system, the Ardois night signal code, and a system of wireless telegraphy invented by officers of the navy. The wig-wag system is the simplest of all, and in most general use when vessels of a fleet are lying in close proximity to each other. It is carried on by means of a small flag of conspicuous color, mounted on a staff some six or seven feet long. This is held by the person sending the message and is waved down, or to the right or left, in accordance with an understood arrangement. To the right, means one; to the left, two; to the front, three; and, these numbers represent various combinations of the letters of the alphabet. It is a slow method and is limited to short distances. The international code, which is used by all vessels at sea, consists of 18 flags, of which there are 13 square ones, 4 pennants and one burgee. These flags represent the consonants, and in order to spell out a message combinations of three or four, having the same meaning in all languages, are hoisted to the top of the signal mast. As every vessel carries a copy of the code, it is easy to communicate at sea with ships of all nationalities.

Signals

It is readily understood, however, that in time of war there must be some way of sending messages to the different vessels of a fleet which cannot be deciphered by the enemy, and for this purpose a secret naval code is used. At night signals are given by means of double lanterns, the upper one of each set being red, in which are incandescent globes connected by means of electric wires with a keyboard, on which are marked all the letters of the alphabet. These are worked very much in the same manner as the wig-wag flags, and can be seen at a distance of nearly 4 miles. The search light, or electric arc light, is used with the greatest advantage in night signalling in the army and navy, and in general navigation. To send messages from a long distance out at sea back to the place of starting, carrier pigeons were formerly employed, but their use in the navy was abandoned in 1901. In 1901 a device was perfected by A. J. Mundy, of Boston, by which persons on vessels 12 miles apart can communicate with each other without the use of wires, lights or flags. Signals are made by means of a large bell sunk under water and rung by a hammer connected with an electric wire, which runs to a keyboard. By pressing the keys a variety of strokes can be given by the operator. The sound of this bell can be heard by a person in the hold of a vessel a mile away, and by the submersion of a common ear trumpet fastened to a six-foot length of gas pipe the sound can be heard at a distance of 3 miles. For greater distances an electrical receiver and annunciator are used, by means of which a bell 12 miles distant cannot only be heard but echoed on a large gong in the pilot house. The receiver is shaped like a gigantic ear and submerged; it automatically announces the approach of other vessels; the clicking of the machinery of a small tugboat 5 miles away being distinctly heard. This invention is of great importance in navigation, as it obviates the possibility of collisions in fog. See Carrier Pigeon: Marconi: Wireless Telegraphy.

Signals, Railroad. At night colored lights are used, and during the day colored flags are displayed to convey information. Red always signifies danger and is a signal to stop. Any person may stop a moving train by displaying a red signal on the

track. The rules of all railroads make this imperative. Green signifies caution, and is the signal to go slow. These signals are usually displayed at night in the vicinity of stations, or during heavy rains at culverts or drawbridge crossings. White signifies safety, and is the signal to go ahead. Blue is a signal seldom used, and is placed on a car or engine to forbid its being moved, as in the case of an accident. Sometimes torpedoes are placed on the track when lights are not available. This means that the train must be stopped immediately, as there is possible danger ahead. Torpedoes have the same meaning as red lights or flags. Colored fuses are also placed on the track, and have the same meaning as colored lights. Torpedoes and fuses are unseen and unheard by the passengers of a train.

The whistle signals of the engineer may be easily learned by travelers, and will afford much amusement as well as information as to what is transpiring outside the car. One long blast is the signal for approaching stations, drawbridges, railroad crossings, and junctions. One short blast is the signal to apply the brakes, and two long blasts is the signal to release them. Three long blasts, to be repeated till answered by trainmen, is a signal that the train has parted. A succession of short blasts of the whistle is an alarm for persons or cattle on the track.

Lantern signals are the most common in use on all railroads, but are most generally used by freight crews. They are used much the same as flags are displayed, with certain movements from right to left, vertical, swung in a circle, etc. Fixed signals will be found in every railroad switchyard and in the vicinity of stations. They are placed there for the guidance of the engineer and indicate whether or not the track is clear, if there is danger ahead, if the train is to stop, etc. The same signals are used for freight and passenger trains, but there are additional safeguards for trainmen on freight trains for which the passenger crews have no use. One device consists of two high poles on each side of the track supporting a crossbeam. From this beam there hangs a multitude of strings much resembling shoestrings. These are called "whips," and are danger signals. They are placed a short distance on either side of a viaduct, covered bridge or other overhanging projection to warn the brakeman who may be riding on top of freight cars in the darkness that they are approaching such places. The whips striking the trainman warn him of the danger in time to allow him to lie flat. Otherwise he may be swept from the car and killed, a not uncommon occurrence in railroading. See BLOCK SYSTEM: METEOROLOGY: WEATHER BUREAU.

Signature, in music, in writing music in any key with sharps or flats, the sharps and flats belonging to the key, instead of being prefixed to each note as required, are placed together immediately after the clef on the degrees of the staff to which they belong; and this collection of sharps or flats is called the signature. In printing, a letter or figure at the bottom of the first page of each sheet, to denote the order of the sheet and to facilitate the arrangement of them for binding.

Signatures, Doctrine of, an old medical theory, which supposed that plants and minerals indicated by their external characters the diseases for which nature had intended them as remedies. Thus the Euphrasia, or eye-bright, was, and is, supposed to be good for the eyes, on the strength of a black pupil-like spot in its corolla, the yellow turmeric was thought good for jaundice, and the blood stone is probably used to this day for stopping blood. By virtue of a similar association of ideas, the ginseng, which is still largely used in China, was also employed by the Indians of North America, and in both countries its virtues were deduced from the shape of the root, which is supposed to resemble the human body.

Signboard, a board on which a man sets out his occupation or gives notice of articles for sale. Signboards were known to both Greeks and Romans. There are allusions to them in classic writers; and specimens have been found at Pompeii and Herculaneum, sometimes painted, but oftener carved. A bush was the sign of many taverns as late as the reign of James I., and the antiquity of that sign may be inferred from the analogy of our proverb, "Good wine needs no bush," to the Latin "*Vino vendibili suspensâ heredâ non opus est.*" During the illiterate Middle Ages every trade had its emblem, some of which have survived to our day, as the chemist's pestle and mortar, the pawnbroker's three balls, and the barber's pole, with in Scotland (as on the Continent) the brazen basin, which recalls Don Quixote. Besides these trade emblems, every individual trader might have his own special device: Southey's father, a Bristol linen draper, for his chose a hare. The old printers' emblems were akin hereto, as today are trade marks. During the 16th and 17th centuries huge painted signs came greatly into vogue. They were suspended either from projecting metal work, from a post or an obelisk, or from a sort of miniature triumphal archway, and sometimes cost great sums — *e. g.* $5,287 for the "White Hart" at Scole in Norfolk, erected in 1655. These creaking and ponderous signboards proved a source of annoyance, sometimes of positive danger, as when in 1718 one in Bride's Lane, Fleet

Street, dragged down a house front and killed in its fall four persons. So in 1762–1770, under act of Parliament, the London signboards were either wholly removed or at least affixed to the fronts of the houses; and this example was gradually followed throughout the kingdom, though here and there signposts linger or have been restored — even in London.

One of the oldest and most interesting signs still existing is the "Red Lion" at Martlesham, Suffolk, for it was the figure-head of one of the Dutch fleet defeated off Southwold in 1672; but the history even of vanished signboards has no slight interest. A good many signboards have been painted by great artists, Holbein, Correggio, Paul Potter, Hogarth, Wilson, Morland, David Cox, "Old" Crome, Sam Bough, and Sir J. E. Millais (some of which are still extant); and nearly every sign had its curious origin, hard though it may be to come at. Thus, there were the religious signs ("Salutation," "Lamb and Flag," etc.), historical signs (as the "Royal Oak" and "Marquis of Granby"), heraldic (coats of arms, crests, and badges), humorous (as the "Good Woman," without a head), and a host of others. Not the least curious feature about old signs is the havoc played on them by "folk-etymologies," which have, for instance, corrupted the "Bacchanals" into "Bag o' nails," "Boulogne Mouth" (*i. e.*, the entrance to Boulogne harbor) into "Bull and Mouth," the "Catherine Wheel" into "Cat and Wheel," and, more dubiously, "Caton fidèle" (a faithful Governor of Calais) into "Cat and Fiddle," "God Encompasseth" into "Goat and Compasses," and "Piga wassail" into "Pig and Whistle."

Signet, a seal, especially the seal used for the seal manual of a sovereign; as in England, one of the seals for the authentication of royal grants. In Scotland the signet is a seal by which royal warrants for the purpose of justice seem to have been at one time authenticated. Hence the title of "clerks to the signet," or "writers to the signet," a class of legal practitioners in Edinburgh who formerly had important privileges which are now nearly all abolished. They act generally as agents or attorneys in conducting causes before the Court of Session.

Significavit, in ecclesiastical law, a writ, now obsolete, issuing out of Chancery on certificate given by the ordinary of a man's standing excommunicate for the space of 40 days, for the keeping him in prison till he submit himself to the authority of the Church.

Sign Manual, Royal, the signature of the sovereign, which must be adhibited to all writs which have to pass the privy seal or great seal. The sign manual consists usually of the initial letter of the sovereign's name, with the letter R (for *rex* or *regina*) added.

Signorelli, Luca (called also, from his birthplace, Luca di Cortona), an Italian painter; born in Cortona, Italy, about 1441, and studied under Piero della Francesca at Arezzo. He began to distinguish himself about 1472, and painted till 1512, or perhaps later. He was the first to apply anatomical knowledge to painting, and thus became the precursor of Michael Angelo. His greatest works are a series of magnificent frescoes in the Cathedral of Orvieto, com-

MADONNA ALTAR-PIECE, BY SIGNORELLI.

prising the "History of Antichrist," the "Resurrection of the Dead," "Hell" and "Paradise." These frescoes were finished between 1499 and 1502. Of his other works the most remarkable are the "Madonna Enthroned," in the Cathedral of Perugia; the "Adoration of the Magi," now in the Louvre; the "Annunciation," and a "Madonna," at Volterra. He died in Cortona in 1523.

Sigourney, Lydia (Huntley), an American author; born in Norwich, Conn., Sept. 1, 1791. In her "Letters of Life," published (1866) posthumously, she enumerates 46 distinct works wholly or partially from her pen, besides over 2,000 articles in prose

and verse, contributed by her to nearly 300 periodicals. Among her other publications are: "Pleasant Memories of Pleasant Lands," a record of her visit in Europe made in 1840 (1842); "Scenes in My Native Land" (1844); 'Water Drops: A Plea for Temperance" (1847); "Gleanings," poems (1860); and "The Man of Uz, and Other Poems" (1862). She died in Hartford, Conn., June 10, 1865.

Sigsbee, Charles Dwight, an American naval officer; born in Albany, N. Y., Jan. 16, 1845; was graduated at the United States Naval Academy in 1863; served in the Gulf blockading squadron during the latter part of the Civil War; and participated in the battle of Mobile Bay. After the war he commanded a Coast Survey vessel, and served for several years in the hydrographic office of the Navy Department at Washington. He invented a deep-sea sounding apparatus and was permitted to accept the Order of the Red Eagle from the Emperor of Germany in recognition of his services in superintending its construction abroad. As captain he was assigned to the command of the battleship "Maine" in 1897. He showed great coolness at the time of its destruction in Havana harbor, and the testimony before the Court of Inquiry proved that he had been extremely watchful and had maintained the most perfect order in all the appointments of the vessel and the strictest discipline on the part of the crew. During the American-Spanish War he commanded the auxiliary cruiser "St. Paul," which rendered excellent service as a naval scout. The deepest valley in the Gulf of Mexico is named "Sigsbee's Deep," after Captain Sigsbee, and the scientific name of *Sigsbeia murrhina* is given to one of the rarest species of deep-sea fauna. It was Sigsbee, too, who discovered near the Morro light, not far from the spot where the "Maine" was sunk, many beautiful specimens of the pentacrini, or sea lilies, and who, while in command of the "Blake," placed at the disposal of scientific investigators the first extensive collection of this ancient genus. Alexander Agassiz declared that the success of the scientific party in the "Blake" was largely due not only to Captain Sigsbee's capacity as commander and to his active interest in scientific investigation, but to the numerous improvements in the apparatus for deep-sea dredging and sounding originating with him. In 1898 Captain Sigsbee was given command of the battleship "Texas"; in 1900 became chief of the bureau of naval intelligence; in 1903 was promoted rear-admiral; and Jan. 17, 1904, was detailed to represent the Navy Department at the Louisiana Purchase Exposition in the section of oceanography. He is the author of "Deep-Sea Sounding and Dredging"; "Personal Narrative of the Battleship Maine"; etc. See DEEP-SEA EXPLORATIONS.

Sigurd, or **Sigurdr,** in Northern mythology, the hero of the Volsunga Saga, on which the "Nibelungenlied" is based. According to the legend of the Volsungs, Sigurd (the Siegfried of the "Nibelungenlied") is the posthumous son of Sigmund, son of Volsung, a descendant of Odin. After obtaining the golden treasure by slaying the dragon Fafnir with his good sword, Gram, he eats the monster's heart, and thus acquires the power of understanding the songs of birds. He then rides through a volume of flame surrounding a house in which the fair Brenhyldr (Brunhild) lay asleep. He wakes Brenhyldr, to whom he plights his troth, and then rides to the palace of Giuki the Niflung, whose wife gives him a potion which causes him to forget Brenhyldr, and he marries Gudrun (Chriemhild), Giuki's daughter. Her brother Gunnar (Gunther) determines to marry Brenhyldr, but is unable to ride through the flames; so his mother by her arts causes Sigurd to go through the flames and bring away Brenhyldr in the form of Bunnar. Sigurd then resumes his shape, and Brenhyldr is handed over to Bunnar. When Brenhyldr hears the true story of her rescue, her love for the hero turns to hatred, and she seeks to slay him. Sigurd is eventually killed by Gunnar's half brother. His death revives Brenhyldr's love, and she dies of a broken heart.

Sihun. See JAXARTES.

Sikhs, a religious sect in Hindustan, which worships one only and invisible God. Its founder was Nanak Shah, born in 1469 in the province of Lahore. He labored to lead the people to a practical religion, to a pure worship of God and love to mankind. He died about 1540. Of his successors, Arjun-mal gave stability and unity to the religion by publishing Nanak's writings in the Adi-Granth, the first sacred book of the Sikhs. The Sikhs had now rejected the authority of the Koran and the Vedas, and thus aroused the enmity both of the Mohammedans and Brahmans. Arjun-mal was thrown into prison, where he died. His son and successor Har Govind transformed the Sikhs from peaceful believers into valiant warriors, and under his reign began the bloody contest with the Mohammedans. The real founder of the Sikh state was Govind Sinh or Singh, the 10th ruler from Nanak. He abolished the system of castes and gave all men equal rights. His followers, owing to their valor in the protracted contest with the Mohammedans, received the title of Sinhs or lions. Govind Sinh wrote the Dasema Padshah ke Granth, or book of the 10th prince, which, besides treating of religious subjects, contained the history of the author's exploits. The Sikhs hold it

in equal veneration with the Adi-Granth. Govind Sinh died in 1708, and the Sikhs gradually yielded to the superior power of the Mohammedans. A small number of the Sikhs escaped to inaccessible mountains, and preserved the doctrines of their fathers and an inextinguishable hatred toward the Mohammedans. After Nadir Shah's return to Persia they left the mountains and subdued all Lahore. The Sikhs then broke up into a number of independent communities, each governed by a sirdar; but in 1792 Runjeet Singh established himself as despotic ruler of the Sikhs, with the title of Maharajah. The territory of the Sikhs now comprehended the whole Punjab, part of Multan, and most of the country between the Jumna and Sutlej; total area, 69,000 square miles. After Runjeet Singh's death in 1839 a period of anarchy followed. In 1845 (first Sikh war) the Sikhs attacked the British under Sir Hugh Gough at Mudki. Here they were repulsed (Dec. 18), and again defeated at Ferozeshah three days later. On Jan. 20, 1846, the Sikhs were routed by Sir H. Smith near Aliwal, and on Feb. 10 by Gough at Sobraon. A treaty was signed by which Great Britain held the city of Lahore, and a British resident took supervision of the government. In 1848 a general revolt broke out, and it was evident that the Sikhs had resolved on a decisive struggle, being assisted by the Afghans. In this the second Sikh war, Lord Gough advanced with an army against them, but received a severe check at Chillianwalla, Jan. 13, 1849. Both armies were then reinforced, and on Feb. 21, at Gujerat, the power of the Sikhs was completely broken. The Sikh dominion was proclaimed at an end, and the Punjab was annexed to the British empire in India, the Maharajah Dhulip Singh receiving an annuity of $245,000. The bulk of the Sikhs are of Jât origin; they are of fine physique, and possess great powers of endurance as well as courage. During the mutiny the Sikhs displayed the utmost loyalty to the British.

Si=kiang, or **West River,** China, by far the most important of the streams which unite to form the Canton river. It is navigable for vessels drawing 12 feet 75 miles from the sea.

Sikino (ancient, Sikinos), a small island of the Cyclades, in the Grecian Archipelago, E. of Melos; area, 17 square miles. The surface is lofty, but the soil is fertile. The staple product is wine.

Silage. See ENSILAGE.

Sikkim, a native State in the Himalayas, between Nepal and Bhutan, in political connection with the government of Bengal; area 2,702 square miles. It is important as containing the most direct trade routes from India into Tibet, which have hitherto been kept closed by the jealous influence of the Chinese government. The ruling family is Buddhist in religion and of Tibetan descent. In 1835 the sanitarium of Darjeeling was ceded to the British in consideration of a payment at first of $3,000, now of $6,000, per annum. In recent years much has been done to develop the transit trade with Tibet. The lieutenant-governor of Bengal has had repeated interviews with the rajah and his minister. The capital is at Tumlung from November to May; for the rest of the year it is removed to Chumbi, on the Tibetan side of the range. The products are rice, Indian corn, millet, oranges, tea, and cotton cloth; the minerals are lime and copper. Pop. (1901) 59,242.

Silaus, pepper saxifrage, a genus of *Seselinidæ* (Lindley), of *Sehultzieæ* (Sir J. Hooker). Partial involucre, many-leaved, calyx obsolete; petals obcordate, subemarginate, with an inflated point appendaged or sessile. Fruit oval; carpels with five sharp, somewhat winged ribs, and many vittæ between. Known species, two.

Silchester, a village in the extreme N. of Hampshire, England; 7 miles N. of Basingstoke; is famous for the remains of the ancient Romano-British town of Caer Segeint, called by the Romans Calleva, and by the West Saxons Silceastre. The chief visible remains are the amphitheater, 50 yards by 40, and the walls, 2,760 yards in length; excavations have shown the foundations of a basilica, the forum, a temple, baths, etc.; and coins, seals, rings, and much broken pottery have been found. New excavations were begun in June, 1890. See "The History and Antiquities of Silchester" (1821).

Silene, in botany, the catchfly; the typical genus of *Sileneæ;* calyx gamosepalous, tubular, often ventricose, five-toothed, 10-nerved; petals five, clawed, mostly crowned at the mouth, and with the limb generally notched or bifid; stamens 10; styles usually three; capsule three-celled below, six-toothed above, many seeded; species 200, from the north temperate zone. Many species are cultivated as ornamental plants in gardens. Darwin mentions silene as a genus in which it is nearly impossible to produce hybrids, even between the most closely allied species. *S. otites* is bitter and astringent; it has been given in dropsy. A decoction of the root of *S. virginica* has been used as an anthelmintic.

Silent City, a popular and poetical name for a cemetery.

Silent Sister, The, a name bestowed on Trinity College, Dublin, the slight influence on modern thought exercised by it being out of all proportion to its great endowments and resources.

Silenus, in mythology, a primitive woodland deity of Asia Minor, whom men try to catch when in a drunken sleep, in order to compel him to prophesy and sing. Later representations make him a son of Hermes or of Pan, and the chief of the Sileni or older Satyrs, and the inseparable companion and instructor of Dionysus, with whom he took part in the contest against the Gigantes, slaying Enceladus. He is described as a little pot-bellied old man, bald-headed and snub-nosed, his body very hairy, always drunk and bearing a skin of wine, and usually propped up by the other satyrs or astride of an ass, since his own legs could not be trusted.

SILENUS WITH INFANT BACCHUS.

Silesia (German, Schlesien), a territory of Central Europe, now divided politically between Prussia and Austria. Prussian Silesia, the largest of the Prussian provinces, is bounded E. by Posen and Poland, S. by the Austrian territories, W. and N. by Saxony and Brandenburg; area, 15,566 square miles. The province is intersected by branches of the Sudetic Mountains in the S., but is level toward Brandenburg and Posen, and though in parts marshy and sandy is yet fertile. The principal river is the Oder. Silesia produces corn, beetroot, flax, madder, hemp, hops, tobacco, fruits, and tolerable wines. The mountainous parts yield timber and afford good pasturage and meadow land. Minerals include iron, copper, lead, silver, coal, sulphur, etc., and there are mineral waters in several places. Linen, lace, cotton, and woolen goods, and leather, glass, earthenware and iron ware are the chief manufactures. Silesia is divided into three governments — Breslau, Liegnitz, and Oppeln. Breslau is the capital.

Silesia was annexed to Poland in the beginning of the 10th century. In 1163 it became independent, and was governed by three dukes of the royal house of Piast. At the beginning of the 14th century 17 independent dukes reigned in Silesia at one time, and ruined the country by their feuds. In order to escape the grasp of Poland it acknowledged the sovereignty of the Bohemian kings. In 1675 the ducal line of Piast became extinct, and the country was incorporated in the Austrian dominions. In 1740 Frederick II. of Prussia laid claim to part of Silesia (based on old agreements to which effect had never been given), and in 1763, at the close of the Seven Years' War, a great part of Silesia was ceded to Prussia. Pop. (1905) 4,942,611.

Austrian Silesia consists of that part of Silesia which was left to Austria; area, 1,987 square miles. It is mountainous, and though the soil is not in all parts favorable, it is rendered productive by the industry of the inhabitants, who are also extensively engaged in linen, cotton, and woolen manufactures. Pop. (1900) 680,422.

Silhouette, a profile or outline representation of an object filled in with black. The inner parts are sometimes touched up with lines of lighter color, and shadows are indicated by a brightening of gum or other lustrous medium. The art was known to the ancients, and specimens may be studied on Etruscan vases. The first notice of the modern practice of the art was in regard to portraits made by Elizabeth Pyberg, who cut the profiles of the English sovereigns, William and Mary, out of black paper, 1699; but the name silhouette was not used till 1757. It was given in derision of the French Minister of Finance, Etienne Silhouette, he having vexed the people of Paris by many salutary and some rather trifling reforms; the wits, therefore, dubbed any very cheap article a silhouette.

Silica, oxide of silicon. Pure silica occurs in nature, crystallized in six-sided prisms, terminated by six-sided pyramids in rock crystal and some other forms of quartz. It enters largely into the compo-

sition of agate, chalcedony, flint, opal, sandstone, felspar, and a vast number of other minerals. In a perfectly pure state it is quite transparent and colorless. Its hardness is next to that of the precious stones, and it has a sp. gr. of 26. It fuses in the oxy-hydrogen blowpipe, and may be drawn into threads like glass. It is insoluble in water when anhydrous, and in all acids except the hydrofluoric. When heated alone, silica is not volatile, but when heated with water it undergoes partial sublimation at a high temperature. Silica presents the general characters of an earthy base, but acts as an acid, forming with the bases compounds known as silicates. These are very abundant in nature; clay, felspar, mica, hornblende, and a large number of other common minerals are compounds of this description.

Silica may be obtained pure by fusing one part of finely-powdered quartz or sand in a platinum crucible, with 2½ parts of a mixture in equivalent proportions of the carbonate of potash and soda, the mineral being added to the fused mass from time to time until the whole of the carbonic acid is driven off. The fused mass is allowed to cool, and is dissolved in very dilute hydrochloric acid and filtered. It is then evaporated to dryness, and the residue is again heated with hydrochloric acid and thrown on a filter, washed with hot water, dried, and ignited. In this state it forms a finely-divided gritty white powder, insoluble in water and acids, with the exception of hydrofluoric acid. It may be precipitated in a gelatinous form by the decomposition of fluoride of silica by water, being considerably soluble in that liquid. The industrial applications of silica are very numerous. Glass and pottery are compounds of silica with various metallic oxides. It is extensively used in metallurgical operations as a flux for effecting the decomposition of ores by the formation of a light glassy slag which floats on the top of the molten metal, carrying with it the impurities in the mineral. Formula, SiO_2.

Silicate Paint, natural silica, when dried and forming an almost impalpable powder, mixed with colors and oil. Unlike the ordinary lead paints, all the silicate colors are non-poisonous. Silicate white has great covering power; it is not affected by gases; and heat of 500° is successfully resisted.

Siliceous Sinter, in mineralogy, a spongy or cellular form of silica, mostly hydrated, and therefore referable to Opal (*q. v.*), brought to the surface and deposited by thermal waters, occasionally the deposit is more or less compact with a vitreous luster, and in this case is not to be distinguished from true opal.

Silicic Acid, a weak polybasic acid obtained by acting on a solution of sodic and potassic silicate with hydrochloric acid; symbol, $SiHO_4$. On concentrating the solution, the silicic acid separates out as a gelatinous precipitate. It is very unstable, having a great tendency to give off water and form the anhydride.

Silicic Anhydride, silica; silicic oxide; symbol SiO_2; occurs in nature as sand, flint, rock crystal, quartz, etc., and is readily prepared by heating silicic acid to 100°. In the amorphous state it is a fine white powder, sp. gr. 1.9-2.3, but in the crystalline condition it exists in the form of hexagonal prisms, terminated by a hexagonal pyramid, as in rock crystal, sp. gr. 2.69. In both forms it is insoluble in water and acids, with the exception of hydrofluoric acid.

Silicic Chloride, in chemistry, $SiCl_4$; obtained by heating a mixture of finely divided carbon and silicic anhydride in a current of dry chlorine. It is a colorless, mobile liquid, fuming in contact with air; sp. gr. 1.52, and boiling at 59°. Water decomposes it instantaneously, with formation of silicic and hydrochloric acids.

Silicic Ethers, silicates of alcohol radicles, produced by the action of alcohols on silicic chloride.

Silicic Fluoride, a colorless gas with pungent odor; symbol SiF_4; prepared by heating a mixture of quartz, sand, fluorspar, and concentrated sulphuric acid, and collecting in a dry vessel over mercury. It fumes in contact with air, and under a pressure of 30 atmospheres condenses to a colorless liquid.

Siliciophite, in mineralogy, a name given by Schrauf to a substance supposed to have an intermediate composition between olivine and opal, and resulting from the alterations of the former.

Silicispongiæ, in zoölogy, an order of sponges. Skeleton characterized by siliceous spicules which may or may not be united into a fibrous skeleton. They are the most highly developed of the class, and its most numerous division. They exist in all seas. The only family of fresh-water sponges comes under this order. Families, or sub-orders: *Monaxonidæ, Tetractinellidæ,* and *Hexactine lidæ.*

Silicoborocalcite, a compact to earthy mineral occurring in small nodules in anhydrite or gypsum near Windsor, Nova Scotia; hardness, 3.5; sp. gr., 2.55; luster, subvitreous; color, white; subtranslucent. Composition: Boric acid, 43.0; silica, 15.8; lime, 29.4; water, 11.8 = 100. According to How, the formula should be $2CaOSiO_2 + 2(CaO2BO_3 + HO) + 3HOBO_3$.

Silicon, in chemistry, one of the non-metallic elements, the base of silica, discovered by Berzelius in 1823. It was at first supposed to be a metal, and received the name of silicium; but from its close analogy to carbon and boron it is now considered to be a non-metallic element. It is in the form of its only oxide, silica, the most abundant solid element in nature. It is obtained in a state of purity by igniting the double fluoride of silicon and potassium with sufficient potassium to combine with the whole of the fluorine. The mass is washed first with cold, and then with hot water. Silicon thus obtained is a dull-brown powder, sinking in water, in which it is insoluble. It soils the fingers when touched, is a non-conductor of electricity, and is insoluble in all acids but the hydrofluoric. Heated in oxygen or air, it burns with a brilliant flame, being converted into silica, its only oxide. If heated in a closed platinum crucible its properties become changed. It is now insoluble in hydrofluoric acid, it is decreased in bulk, and may be heated strongly in air and oxygen without taking fire. Deville describes a kind of modification of silicon which has the appearance of platinum filings. It is formed by acting with hydrochloric acid or silicide of sodium and aluminum. Silicon unites with hydrogen, forming a gas spontaneously inflammable in air or oxygen. It also forms compounds with sulphur, chlorine, bromine, fluorine, and one or two other elements; but these combinations possess little or no practical interest. Equiv., 28; symbol, Si.

Siliqua, or **Silique,** in botany, a dry, elongated pericarp, consisting of two valves held together by a common suture or replum from which they ultimately dehisce. It contains many seeds attached to two placentæ adhering to the replum, and opposite to the lobes of the stigma. Lindley places it under his compound fruits. It is also the name of a weight of four grains used in weighing gold and precious stones; a carat.

Silistria, a town of Bulgaria, on the right bank of the Danube, 66 miles N. E. of Shumla. For five centuries it was the main defensive point of the Turkish empire on the N. E. It was an ill-built and dirty town till the Crimean War, but after that time it was considerably improved. Silistria was strongly fortified up to 1878, when the fortifications were decreed, like those of other Bulgarian cities, to be dismantled in accordance with the terms of the Berlin treaty. In May and June, 1854, with a garrison of 15,000, it successfully resisted a siege of 39 days by 60,000 to 80,000 Russians. Pop. (1901) 12,133.

Silius Italicus (sil'i-us it-al'i-kus), a Roman poet; born about A. D. 25. His epic poem "Punica," in 17 books, is still extant; its theme is the second Punic War as its

story is told by Livy and Polybius. To him is attributed "Homer in Latin," a Latin translation of a part of the Iliad. He died about 101.

Silk, the peculiar glossy thread spun by the caterpillars or larvæ of certain species of moths, and a well-known kind of fabric manufactured from it. The chief silk-producing larvæ belong to the family of the *Bombycidæ,* of which group the common silk moth, *Bombyx mori,* is the most familiar species, being that which is by far the most important in artificial culture. This family of moths is distinguished by the small size of the proboscis, by the thick hairy body; and by the large, broad wings. The common silk moth possesses a short body, stout legs, and white wings,

COMMON SILKWORM.

a, larva, full grown; b, larva, seripositing; c, cocoon; d, chrysalis; e, female moth; f, male moth.

which are marked by black lines running parallel with the wing borders. The female moth deposits her eggs in summer on the leaves of the mulberry tree, *Morus alba.* For hatching artificially the eggs are placed in a room heated gradually up to a temperature of about 80° F. In 8 or 10 days the young appear. The caterpillars are then covered with sheets of paper on which mulberry leaves are spread, and make their way through perforations in the paper to the mulberry leaves, their natural food. The leaves when covered with caterpillars are laid on shelves of wicker work covered with brown paper. When first hatched the larvæ or worms are black and about ¼ inch long. The larval or caterpillar stage lasts from six to eight weeks, and during this period the insect generally casts its skin four times. After casting its last

Silk

skin the insect is about two inches long, and in 10 days attains its full growth of three inches. The insect's body consists of 12 apparent segments, with six anterior fore-legs, and 10 fleshy legs or "prolegs" provided with hooks in the hinder body-segments. The mouth is large, with powerful jaws. At this stage the insect becomes languid, refuses food, and prepares for its next change into the pupa or chrysalis stage.

Oak, broom, or other twigs are now laid on the wicker frames, and the worms crawl into these, where they spin their cocoon by winding a self-produced silk thread many times round their body. This silky thread is formed from a glutinous secretion contained in two tubular glands on either side of the body, opening on the lower lip of the larva in a prominent aperture called the "spinneret." This secretion becomes tenacious and thread-like when brought in contact with the air, and the two filaments unite as they issue from the spinneret, apparently by the glutinous secretion of another and special gland. The spinning of the pupa case or cocoon lasts from three to five days. After passing about three weeks in the nymph or chrysalis stage, the larval form emerges from the cocoon as the perfect moth or "imago." But those insects destined to afford the silk material are not allowed to enter the "imago" stage. The completed cocoon with its contained larva is thrown into warm water, which dissolves the glutinous matter cementing the threads together, and facilitates the unwinding of the silk. The average length of a thread furnished by a single cocoon is 300 yards. About 12 pounds of cocoons yield one pound of raw silk, and one ounce of silk-worms' eggs will give 100 pounds of cocoons. The female moth produces from 300 to 500 eggs.

For the perfect and successful cultivation of the silk worm, vigorous and healthy mulberry trees are necessary. The favorite European species is *Morus alba* or white mulberry. Other noted species are *M. alpina*, *M. Moretti*, and *M. japonica*, the latter introduced from Japan. Among the most destructive diseases of the silk-moth's eggs and larvæ are those known by the names of muscardine and pébrine. The latter disease created great ravages in France for some years, and ruined many cultivators, but latterly has been successfully combated.

In Europe some moths produce one generation, others two generations annually; but the caterpillars from the former class produce the best silk. In India some forms produce eggs monthly, while three or four generations annually are not uncommon in that country. A valued variety of the *Bombyx mori* is the *Novi* race of Italy, which spins a large white oval cocoon. The Japanese race produces a cocoon having a divided appearance in the center. The *Bombyx Yama-mai*, or Japanese oak-feeding silk moth, produces a green cocoon, the silk of which is much used for embroidery. *B. Peryini* inhabits Northern China and is also an oak feeder. Its cocoon is large and grayish-brown in color. The *B. Cynthia* of China and North Asia manufactures a gray cocoon, from which the Chinese manufacture a silk recognized by its soft texture. From the cocoon of the *Antheræa Paphia* of India, or "tussur moth," the natives manufacture the tussur silk fabric, *Bombyx textor* of Bengal makes a pure white silk used by the natives. There are several other varieties of silk-producing moths, but they are less notable and commercially unimportant.

The Chinese appear to have been the first to render the filamentous cocoon substance serviceable to man, and China is still the chief silk-producing country in the world. Before the reign of Augustus the use of silk was little known in Europe, and the culture of the silk worm was not introduced till the 6th century. It was at first confined to Constantinople, but soon spread to Greece and then through Italy to Spain. When the Duke of Parma took Antwerp in 1585 a check was put on its trade in silk goods, and many of the weavers from Flanders and Brabant took refuge in England. In 1685 the Edict of Nantes drove hosts of silk workers into exile, as many as 50,000 settling in Spitalfields, London. A silk-throwing machine, constructed on Italian models secretly obtained, was fitted up at Derby in 1714 by Thomas Lombe (afterward Sir Thomas Lombe), who obtained a patent in 1719, and on its expiration received a grant of £14,000 ($70,000) for his services to his country. In France looms were set up at Lyons in 1450, and at Tours in 1470. The first nursery of white mulberry trees was founded by a working gardener of Nismes, who ultimately propagated them in many districts in the S. of France. Italy is now the chief silk-producing country in Europe, France coming next.

In the manufacture of silk the first operation is the unwinding of the cocoons and the reeling of the silk. For this purpose they are placed in shallow vessels containing hot water, which softens the gummy matter of the cocoons. The ends of the filaments are then conducted by guides to large reels moved by machinery. Four or five (or more) threads from as many different cocoons are thus brought together, and uniting by the gum form one thread. When the cocoon is half unwound the filament decreases 50 per cent. in thickness. The silk thus produced is called raw silk. Before it can be woven into cloth the raw silk must be thrown. This is often a spe-

cial trade and is usually conducted by machinery in large mills. Previous to throwing, the silk is carefully washed, wound on bobbins, and assorted as to its quality. In the throwing machine it is again unwound from the bobbins, twisted by the revolutions of a flyer, and then wound on a reel. The twist of the silk is regulated as required by varying the relative velocities of the flyer and reel. The silk thus prepared is called "singles," and is used for weaving common or plain silks and ribbons. The next operation, called doubling, is the twisting of two or more of these threads on one bobbin. This is done in a throwing machine, and the silk thus spun is called "tram" silk, commonly used for the weft of richer silks and velvets. Two or more of these threads of tram silk twisted in the throwing mill together constitute "organzine," a species of silk thread used for warps of fine fabrics. But in tram silk the threads are all twisted in one direction, forming individual strands like twine, whereas in organzine the collected threads are twisted in an opposite direction to the twist of the strands, like cable or rope. The silk in this condition is called "hard" in consequence of the gum, which is, however, separated by careful boiling. The throwing machine has been greatly improved both as to accuracy and produce by assimilating it to the cotton throstle. The manufacture of waste silk is quite different from that just described, being more akin to that of wool or cotton. Waste silk consists of the floss silk or outer fibers of the cocoons; of the silk of defective cocoons, such as those from which the moths have been allowed to issue; of the remains of cocoons from which the fiber has been mostly reeled, etc. Until about 1857 this waste was entirely useless, but it is now the object of an important industry, being cleared of the gum by boiling, and subjected to such processes as breaking, combing, drawing, and roving, till it is ready for spinning. In the manufacture of silk fabrics France has held, since 1750, the leading place in Europe, Lyons being the chief seat of the trade.

The cultivation and production of silk was commenced in the United States at a very early period. In 1734 eight pounds of silk cocoons raised in Georgia were taken to England by Governor Oglethorpe. Later, a court dress was made for Queen Caroline of silk made from American cocoons.

Nearly a century afterward the first silk made by machinery in the United States was manufactured at Mansfield, Conn. (1829). Silk cultivation is now a firmly established industry in California and several other States, and there are extensive silk manufactories at Paterson, N. J., Hartford and South Manchester, Conn., Newton, Groton, Northampton and other points in Massachusetts, Philadelphia, Baltimore, New York, etc. Sewing silks of American manufacture are regarded throughout the world as superior in many respects to those manufactured in Italy or elsewhere in Europe. The same is also true of American-made dress silks and ribbons, which are rapidly crowding out those of foreign manufacture. The value of the silk fabrics produced in the United States in 1905 exceeded the sum of $133,288,000. The silk textile industry now exceeds that of France, which for a long while led the world in the production of silk goods.

Silkworm Culture in America. The movement recently inaugurated by the Department of Agriculture looking to a revival of the silkworm industry in America bids fair to prove in a considerable measure successful. That some portions of the United States are well adapted to silk culture has been conclusively demonstrated; and particularly is this true of the Southern States, where not only are climatic and other conditions favorable, but there is available some of the cheapest labor to be found anywhere in the world — a most essential requisite for competition with the foreign silk-producing countries with their facilities for obtaining a minimum cost of production.

Silk culture ranks as one of the comparatively few activities which having once gained a foothold on this continent was allowed to languish and practically disappear. The industry was started in America in 1622 when James I. sought to foster the industry in Virginia. He sent out to the colony silkworm eggs and mulberry trees and offered premiums for colonial silk, but after brief experiments the planters returned to the cultivation of tobacco. In Carolina and Georgia, however, the effort was more successful. Silkworms were brought by the first settlers and the industry speedily took root, flourishing for more than a quarter of a century, during all which time these two colonies exported considerable silk to London. In 1750 a silk-reeling mill was established at Savannah, and in 1759 the exports of raw silk from that port alone showed an aggregate valuation of $75,000.

The Huguenots who settled in the vicinity of Charleston, S. C., in 1677 had also taken up silk culture almost from the date of the establishment of their new home, and for nearly a century from $5,000 to $10,000 worth of silk was annually exported from Charleston, in addition to which a considerable amount was woven and consumed at home. The Revolutionary War had a blighting effect upon the silk industry in all parts of the South, though during the conflict the raw material was made into sewing silk and sold in the home market. Henceforth, however, the history of the in-

dustry in the New World was shifted to the more N. colonies.

The colony of Connecticut was the scene of experiments in silkworm culture as early as 1760, and within a decade after that the industry had also taken root in a small way in New York, Pennsylvania, New Jersey, Rhode Island, and Massachusetts. In all these colonies the industry was seriously affected by the War of Independence, but at its close a greater effort was made for its revival than was the case in the Southern States. Connecticut in 1783 offered a bounty to silk growers and thus attained first rank in the amount of silk produced, a place which she held for four-score years, and in Pennsylvania Benjamin Franklin and other public spirited citizens interested themselves in the restoration of the industry. Silk growing became popular in all the States on the Atlantic seaboard, and the Connecticut output reached a valuation of $200,000 a year, but during the years between 1838 and 1844 large nurseries of Chinese mulberry were planted and there set in that speculative craze that in the end proved the ruination of the industry. For a time yearling trees sold for prices ranging from $3 to $4 each, but in the winter of 1844 a severe frost destroyed hundreds of thousands of the young trees. Instantly the speculation collapsed. Hundreds of silk growers who had purchased trees at fancy prices were ruined and the entire industry received a setback from which it never recovered. It was suggested that the New England silk growers plant a hardier variety of mulberry and retrieve their fortunes, but they preferred to turn their attention to silk weaving, using imported raw silk, and silkworm culture was allowed to languish.

The practical investigation of silk culture by the United States Department of Agriculture began as the result of an agitation of the subject dating from the Centennial Exposition of 1876 and was carried on by virtue of specific appropriations by Congress, continuing, practically, from 1884 to June 30, 1891. The experiments, which were conducted on an extensive scale, the work being under the supervision of the Division of Entomology, established the possibility of raising a most excellent quality of silkworm cocoons over nearly the entire country, but also disclosed the one great obstacle to the industry as a profitable enterprise, namely, the difficulty of finding labor in the United States to compete with the low priced labor of foreign silk raising countries in the operation of reeling or converting the cocoons into raw silk.

All the later work of the department has, therefore, been especially directed to efforts to remedy this state of affairs and to equalize by improved machinery the difference in wages between this and foreign countries, thus making it possible for the manufacturer to pay a better price for cocoons. Electric silk reels and other devices have been introduced, but even with such adjuncts there is little likelihood that the industry will be made a highly profitable one unless a heavy import duty is imposed on reeled silk imported into the United States — a rather unlikely procedure, it must be admitted.

Silkworm Culture in America

For years past silk culture has been carried on in a modest manner in various parts of the country. In Utah, for instance, there are a number of people who are raising silkworms from year to year, growing mulberry leaves for their food and actually producing silk and weaving it into cloths for family use. Mrs. Carrie Williams, of San Diego, Cal., has been engaged in the industry in a small way for some years past, and Dr. W. H. Hill has at Peoria, Ill., an institution from which over 1,000,000 silkworms are shipped annually.

As has been stated, the greatest obstacle to be overcome in the establishment of the industry of silk culture in the United States is found in the labor problem, and it is for this reason that the friends of silk culture look with an especial degree of hope to the field presented by the Southern States now awakening to industrial activity. Raw silk is, it is true, the product of the cheapest labor in foreign countries, but no country has cheaper labor than is available in the Southern States. Children who are unable to do heavy field work can be employed; and, moreover, the entire task may be attended to in April and May when there is no cotton picking. What makes the plan appear especially feasible is the seemingly parallel circumstances which are found in the tea-raising industry in the South. It has been demonstrated within the past few years that tea can be grown profitably in the South, the leaves being gathered by children whose parents are delighted with the addition made by these earnings to the family income. This class of labor can, of course, be employed to pick mulberry leaves and feed silkworms. Another great advantage which will be enjoyed by the Southern States in the raising of silkworms is found in the inexhaustible supply of leaves of the Osage orange which is available in that section of the country. The Osage orange leaves have been found to be as good food for silkworms as mulberry leaves and the silk produced on this diet is of the finest quality. Thus there is removed all possibility of a repetition of the losses which ruined the American silk culture industry during the first half of the last century, and finally, an abundance of Osage orange hedges obviates the necessity for any expenditure whatever in cultivation.

The silkworm is, of course, the larva of a moth. There are several species, but one variety has been under general cultivation for centuries. The silkworm eggs are nearly spherical and about the size of turnip seeds. Each female produces an average of from 300 to 400 eggs, in the neighborhood of 20,000 eggs being required to make an ounce in weight. For a time after the infant worm has gnawed its way out it consumes its own weight of leaves every day. Upon attaining full growth the insect beeomes restless, stops feeding and throws out silken threads. The silk is formed in a fluid condition and issues from the body of the worm in a glutinous state — apparently in a single thread. From this silk the worm constructs its cocoon, an interval of from three to five days being required to complete its imprisonment in the fragile envelope.

In order that the silken strands may not be subjected to the danger of breakage by the moth emerging from the cocoon, the cocoons are steamed till the inclosed insects are presumably dead. After this the silk may be wound off. The outer silk known as "floss" is used for carding, while the inner cocoon is tough, strong and compact and eomposed of a single continuous thread.

It is essential that the room in which the silkworms are reared be warm in winter and well ventilated. If only a few insects are reared all the operations are usually performed on trays set on tables, but where the industry is carried on extensively there are employed deep shelves ranged one above another. The eggs when about to hatch are spread thinly and over them is placed ordinary mosquito netting on top of which is scattered finely cut leaves. The newborn worms pass through the meshes of the net in search of food and may then be transferred to any place desired. Later little arches of twigs must be provided, into the branches of which the worms mount and spin their cocoons.

Sill, John Mahelm Berry, an American diplomatist; born in Black Rock, N. Y., Nov. 23, 1831; was graduated at the Michigan State Normal School in 1854; taught there as professor in 1854–1863 and as principal in 1886–1894; was twice principal of the Detroit public schools; member of the State Board of Regents of the University of Michigan in 1867–1870; and United States minister to Korea in 1894–1897. Among his publications are "Synthesis of the English Sentence" (1856), and "Lessons in English" (1879). He died in Detroit, Mich., April 6, 1901.

Silliman, Benjamin, an American scientist; born in North Stratford, Conn., Aug. 8, 1779; was graduated at Yale College in 1796 and admitted to the bar in 1802. At the solicitation of President Dwight, of Yale, he abandoned law to devote himself to science, and in 1802 was chosen Professor of Chemistry and Natural History at Yale. After teaching for a number of years he went abroad, and while in Edinburgh became interested in geology. Returning to the United States he began extensive geological investigations, and in 1807 wrote the earliest authentie account of a fall of a meteor in America. In 1811 he began a series of experiments with the compound blow pipe and obtained for the first time in the United States the metals sodium and potassium. He discovered the fusion of the carbons in the voltaie arc in 1822; opened the Lowell Institute in Boston with a course of lectures on geology in 1838; was chosen president of the American Association of Geologists and Naturalists in 1840; and was one of the corporate members named by Congress for the formation of the National Academy of Sciences in 1863. In 1818 he founded the "American Journal of Science," which he conducted as sole editor till 1838 and as senior editor till 1846. Among his numerous publications are: "Elements of Chemistry"; "Consistency of Discoveries of Modern Geology with the Sacred History of the Creation and the Deluge"; "Narration of a Visit to Europe in 1851"; etc. He died in New Haven, Conn., Nov. 24, 1864.

Silliman, Benjamin, an American chemist; son of the preceding; born in New Haven, Conn., Dec. 4, 1816; was graduated at Yale University in 1837, and immediately became an assistant to his father, then Professor of Chemistry at Yale. At the foundation of the Sheffield Scientific School at Yale, in 1847, he was made Professor of Chemistry in the School of Applied Chemistry. He had charge of the chemical, mineralogical, and geological departments at the World's Fair in New York city in 1853; was called to a chair in the academic chemical and medical departments of Yale in 1854; delivered the first series of lectures on agricultural chemistry ever given in the United States, in New Orleans, in 1845–1846; and in 1869 became one of the State chemists of Connecticut. He was named as one of the original members of the National Academy of Sciences in 1863, and served on several of its most important committees, notably that appointed in 1882 to report the use of sorghum. His scientific papers numbered nearly 100, and covered a wide range of topics. In addition he published: "First Principles of Chemistry"; "Principals of Physics"; and "American Contributions to Chemistry." He died in New Haven, Conn., Jan. 14, 1885.

Silliman, Benjamin Douglas, an American lawyer; born in Newport, R. I., Sept. 14, 1805; was graduated at Yale University in 1824 and admitted to the bar in

1829. He began his political career as a member of the Assembly from Brooklyn, N. Y., in 1838, and three years later became prominent in Whig politics. He was appointed United States District Attorney for the Eastern District of New York in 1864; was a member of the convention which revised the New York State constitution in 1872; and was defeated as Republican candidate for attorney-general of New York in 1873. He was identified with many social, political and philanthropic institutions, and was one of the founders of the Bar Association of New York city. He died in Brooklyn, N. Y., Jan. 24, 1901.

Silliman, Reuben Daniel, an American lawyer; born in Hudson, Wis., May 17, 1871; was graduated at the law department of the University of Michigan in 1894; and admitted to the bar the same year. He practised law in Duluth, Minn., in 1894–1898, and in Honolulu in 1898–1899; was appointed judge of the Circuit Court of the 1st Circuit in the Hawaiian Islands, in March, 1900, by President Dole of the Republic of Hawaii; and to the same office by President McKinley, in June, 1900.

Siloam, or **Siloah,** a pool in Jerusalem, fed by the waters of the Gihon and forming part of the ancient water-supply system of the city. In 1880 the famous "Siloam inscription" was discovered in the aqueduct. It is the oldest Hebrew inscription known and has reversed the opinions of modern critics on certain points, by proving the high degree of knowledge and culture of the Hebrews of a remote period.

Silotvaar, an explosive, invented by the Russian engineer, Rucktchell, in 1886. As compared with ordinary gunpowder, its penetrating power, when used for cartridges, is stated to be 10 times greater. The compound of which the explosive consists is the secret of the inventor. It emits no smoke or heat, and the discharge is unaccompanied by any report.

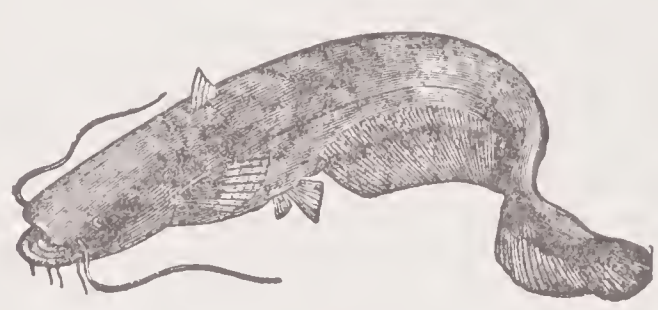
Silurian System, in geology, a term made public by Sir Roderick Murchison in 1839, though he had begun to use it as early as 1835. It implied that, speaking broadly, the rocks so described were well developed in the country of the old Silures. The term has been universally adopted. Murchison divided his Silurian system into Upper and Lower Silurian, contending that the Cambrian system of Sedgwick was not independent, but simply Lower Silurian. Whatever be the case with the Cambrian, the Laurentian system, since established, is unequivocally older than the Silurian. Under the Upper Silurian were ranged in descending order: (1) the tilestone of Brecon and Caermarthen; (2) the Ludlow ironstone and shale, and (3) the Wenlock or Dudley limestone. Under the Lower Silurian: (1) the Caradoc sandstone; (2) the Llandeilo flags and schists. Now the Table of Strata stands thus:

I. Upper Silurian: 1. Ludlow formation; 2. Wenlock formation; 3. Llandovery formation or group.

II. Lower Silurian: 1. Bala and Caradoc beds; 2. Llandeilo flags; 3, Arenig or Stiper Stone Group.

There is a great break between the Upper and Lower Silurian, which are uncomformable, and a greater break between the Upper Silurian and the Devonian. During the early part of the Silurian the land was sinking; during the deposition of the Llandeilo the sea was moderately deep. Algæ, corals, brachiopods, trilobites, and other crustacea, and, in the upper strata, fishes, are the characteristic fossils. The higher vertebrates had not yet appeared. Vast areas in Russia, etc., are covered by Silurian rocks. In America, the Canadian and the Trenton formations are believed to be Lower Silurian; the Niagara formation to be Upper Llandovery and Wenlock, and the Oriskany to be formations of Ludlow age.

Siluridæ, in zoölogy, a family of malecopterygious fishes, the type of which is the genus *Silurus,* comprising species of



SILURUS.

large size, *S. glanis,* of the rivers of Germany and Hungary, sometimes exceeding six feet in length and 300 pounds in weight. They are chiefly distinguished by the want of true scales, having merely a naked skin or large osseous plates. A strong osseous spine forms the first ray of the dorsal and pectoral fins, except in the genus *Malapterusus,* which includes the electrical silurus of the African rivers, whose power of giving electrical shocks appears to derive from a particular tissue situated between the skin of the sides and the muscles. The genus *Pimelodus* contains the cat fishes of the United States, of which there about 30 species. The cat fish of the Great Lakes, *P. nigricans,* is from two to four feet long, and attains the weight of 30 pounds. The common horn pout, or horned pout, *P. atrarius,* is from 6 to 10 inches long, and abounds in ponds and slow streams.

Silurist, The. See VAUGHAN, HENRY.

Silvanus, in Roman mythology, a deity among the Romans, who had the care of

fields and cattle and presided over boundaries. He was usually represented as old, and bearing a cypress plucked up by the roots; and the legend of Apollo and Cyparissus was transferred to him. The usual offering to Silvanus was milk.

In entomology, a genus of *Cucujidæ*. The species infest meal-bins or sugar-casks, and are sometimes seen on windows or floating in tea cups.

Silvas, or **Selvas,** a name given to the immense wooded plains of the Central Amazon, the area of which is estimated at from 750,000 to 1,000,000 square miles. Being low, with a level surface, they are flooded for a fifth part of their extent by the annual rise of the Amazon and its tributaries. The moisture and heat of the climate combine with the richness of the soil to render the forests luxuriant in the extreme, the trees being matted together by innumerable climbing plants which form an impenetrable screen, so that even the jaguar is compelled to advance from tree to tree along the branches instead of along the ground. Unspeakably gloomy in the rainy season, the silvas on its departure are brilliant with countless flowers. Birds, insects, monkeys, and snakes throng these regions, but human life is represented only by a few miserable Indians.

Silver, a precious metal. It appears to have been known almost as early as gold, and, without doubt, for the same reason, because it occurs very frequently in a state of purity in the earth and requires but an ordinary heat for its fusion. Pure silver is of a fine white color. It is softer than copper but harder than gold. When melted its sp. gr. is 10.47; when hammered, 10.510. Its chemical symbol is Ag. It is next in malleability to gold, having been beaten into leaves only .00001 of an inch in thickness. It may be drawn out into a wire much finer than a human hair, and a wire of silver 0.078 of an inch in diameter is capable of supporting a weight of 187.13 pounds avoirdupois. It excels all other metals as a conductor of heat and electricity. Silver melts when heated completely red hot, and may be boiled and volatilized by a very strong and long continued heat. It is rapidly volatilized when heated on charcoal by the flame of the compound blow pipe. When cooled slowly crystals of silver may be obtained. Silver is not oxidized by exposure to the air, or affected by water, but it is blackened or tarnished by sulphuretted hydrogen. The at. wt. of silver is 108. Oxide of silver ($Ag_2 O_3$) is produced by dissolving silver in a solution of nitric acid and precipitating with an alkali. Its sp. gr. is 7.14. The compound called horn silver or chloride of silver (AgCl) is obtained by dissolving silver in nitric acid and mixing the solution with a solution of common salt. Its sp. gr. is 5.550. When exposed to the light it turns to a blackish color, hence its great use in photography. Bromide of silver is the most sensitive to light of any known solid. It is used for coating the "dry plates" employed in photography. When silver is long exposed to the air it acquires a covering of a violet color, which deprives it of its luster; this coating is sulphide of silver. Sulphide of silver occurs native as silver glance. Silver readily forms alloys with iron, steel, lead, tin, and mercury. Of the combinations of acid and silver the most important is nitrate of silver ($AgNO_3$), obtained by dissolving silver in nitric acid. If the silver and acid are pure the solution of silver nitrate is colorless, very heavy, and caustic; it stains the skin and all animal substances an indelible black; after evaporation it deposits, on cooling, transparent crystals of NITRATE OF SILVER (*q. v.*).

There are five important silver ores, native silver, vitreous silver (or silver glance), black silver, red silver, and horn silver. The first is usually found in dentiform, filiform, and capillary shapes, also in plates formed in fissures and in superficial coatings; luster metallic; color silver-white, more or less subject to tarnish; ductile; hardness between gypsum and calcareous spar; sp. gr., 10.47. Native silver occurs principally in veins, traversing gneiss, clay-slate, and other palæozoic rocks, but not usually in great quantity. It often forms a natural alloy with gold. Vitreous silver presents itself in various shapes, and is of a blackish lead-gray color with a metallic luster. It is malleable, about as hard as gypsum, and subject to tarnish; sp. gr., 7.19. It is more or less pure silver sulphide, and has been found almost exclusively in veins along with ores of lead, antimony, and zinc. It occurs in Saxony, Bohemia, Hungary, Mexico, and Peru; and is an important species for the extraction of silver. Black silver generally occurs in granular masses of an iron-black color. It is sectile and about as hard as gypsum; sp. gr., 6.2. This mineral is a composition of silver (about 68.5 per cent.) with antimony and sulphur and traces of iron, copper, and arsenic. It is found in veins along with other ores of silver, and is a valuable ore for the extraction of silver. It occurs chiefly in Saxony, Bohemia, Hungary, and the American continent. Red silver is found in crystals and often massive, granular, and even as an impalpable powder. It is a double sulphide of silver and antimony, containing on an average 60 per cent. of silver. It occurs in veins with other silver ores, galena, and blende. It is found in various parts of Saxony, also in Bohemia, Hungary, and Norway; but chief-

Silver

ly in Mexico, Peru, and the Western United States. Horn silver, or silver ehloride, occurs in erystals and also in erusts and granular masses. It eontains about 76 per eent. of silver. It is found in the upper parts of veins in clay-slate, and also in beds with other silver ores or with iron oehre. It is not abundant in Europe, but oeeurs in large masses in Mexico and Peru. The above are the ores of silver from whieh silver is ehiefly extraeted; but argentiferous sulphides of lead and eopper are also smelted for the smaıl proportion of silver they eontain.

Silver is extracted from its various ores by smelting or amalgamation. The former method is founded on the great affinity of silver for lead, whieh, when fused with silver, acts as a solvent and extracts it from its union with baser metals. The silver is afterward separated from the lead by the process of cupellation whieh eonsists in exposing the melted alloy to a stream of atmospheric air, by which the lead is converted into an oxide (litharge) while the silver remains untouched. The latter method depends on the property of mereury to dissolve silver without the aid of heat. The first is ealled the "dry," the last the "wet" way of treating silver ores. One or the other proeess is employed aecording to the nature of the ores. The ores which are treated in the dry way are usually those consisting principally of argentiferous sulphide of lead. By this method the ore is first pulverized and roasted to expel the sulphur, and is then freed from the lead. The ores best adapted to the proeess of amalgamation are native silver and vitreous silver. The ores are first selected to form a proper mixture with referenee to the quantity of silver and sulphur they eontain. The sulphur is then got rid of by adding to the mixture of an ore 10 per eent. of common salt, by which, during the furnace operation, the sulphur is oxidized, and the aeid thus formed unites with the base of the salt and forms sulphate of soda; while the hydroehlorie aeid thus set free combines with the silver in the ore that was not in the metallie state, and forms ehloride of silver. In this state the ore is reduced to an impalpable powder by various meehanieal proeesses. It is then submitted to the aetion of mereury, with whieh it forms what is ealled an amalgam. This amalgam is subjected to the action of heat in a distilling furnaee, by whieh the mereury is sublimed and the silver remains. Silver is sometimes separated from copper by the process of eliquation. This is effeeted by means of lead, whieh when brought into fusion with the alloy combines with the silver. The argentiferous lead thus obtained is subjected to the usual processes of cupellation, and the coarse copper from which the silver has been separated is refined. Large quantities of silver are now obtained from argentiferous lead ores by a proeess known as Pattinson's proeess, which depends on the property pure lead possesses of crystallizing at a temperature at which an alloy of silver and lead is still fluid, so that the solid crystals of lead ean thus be removed.

The silver mines of North and South Ameriea are ineomparably more important than those of all the rest of the world. The Mexican mines were worked before the Spanish eonquest, and produeed large quantities of silver. There are great deposits of silver in Nevada, Arizona, California, Colorado, Idaho, Montana, New Mexico, and Utah. Silver ore, ehiefly argentiferous galena, has also been found in great quantities in the Barrier Ranges of New South Wales.

In the Andes Mountains and adjaeent seetions are marvelous deposits of silver and other minerals, espeeially iron and eopper. It is elaimed that Bolivia is unsurpassed in her possession of extensive and rich silver mines. Between 1800 and 1825, $67,000,000 were taken from this eountry's mines. It is said that eareful ealculations indieate that Bolivia has produeed a total of more than $4,000,000,000 worth of pure silver. The silver mines of Potosi, "the silver mountain," have yielded about $3,000,000,000 worth of pure metal. These mines are to a great extent exhausted, but at Oruro the deposits are amazingly rich and work in the mines goes on day and night. Peru is but little less fortunate in her silver resourees and it is said more than 2,000 yielding mines are within her boundaries. At Hualgayoc, in Northern Peru, and at the base of the W. spur of the Andes, there are within 40 square leagues 400 silver mines, some of them yielding 300 ounees to the ton. Indians are employed to work in these mines and their only tools are drills, hammers, and raw-hide saeks. They fairly burrow through the mountain, gathering only the richest parts of the ore. Humboldt says these Hualgayoe mines yielded $33,000,000 worth of pure silver in 30 years. No decrease in their product has been detected, but they are not as extensively worked as formerly, owing to a deerease in the priee of the metal. At Casopalca there are many valuable mines. Near this place a tunnel has been made into the mountain 1,700 feet below the working surface.

Considerable quantities of silver are produced in Europe. The average produetion of Germany is about $8,000,000. In Great Britain silver is obtained from argentiferous lead ore to the value of $430,000 annually.

The following is the produetion of silver in the United States in the calendar year 1909:

States and Territories	Commercial value.
Alaska	$82,200
Arizona	1,889,300
California	887,000
Colorado	4,730,100
Georgia	100
Idaho	3,669,500
Michigan	168,500
Montana	6,241,900
Nevada	4,657,000
New Mexico	171,200
North Carolina	300
Oregon	37,000
South Carolina	100
South Dakota	107,000
Texas	186,400
Utah	4,958,900
Washington	38,200
All others	185,400
Total commercial value	$28,010,100
Total fine ounces	53,849,000

The world's production of silver in the calendar year 1908 was estimated at 203,186,370 fine ounces, having a coining value of $262,705,600; production since the discovery of America (1492-1908), 10,220,943,048 fine ounces, with coining value of $13,214,956,600.

The Director of the United States Mint reported the amount of silver used in the coinage of the United States in the calendar year 1909 as 8,024,984 fine ounces, which produced $11,093,810 in subsidiary coin; and the amount used in the coinage of the world (in 1908) as 150,582,664 fine ounces, which yielded $194,692,737 in coin. The quantity of silver bars issued by United States institutions and private refineries in 1908 for use in the industrial arts was 23,775,421.92 fine ounces, and the world's consumption of silver in the arts and industries was estimated at 91,835,000 fine ounces, of the commercial value of $49,122,542. The United States is exceeded in the production of silver by British India only.

Silver, River of. See PLATA, RIO DE LA.

Silver Acetyl, an organic radicle, the compounds of which are obtained by the action of acetylene on ammoniacal solutions of silver salts; symbol, C_2Ag_2H.

Silver Age, the second mythological period in the history of the world, under the care of Jupiter. It succeeded the golden age and was characterized by voluptuousness. The phrase is also applied to a period of Roman literature succeeding the most brilliant period, and extending from about A. D. 14 to A. D. 180.

Silver Certificate, a certificate of deposit issued by the United States treasury for a certain number of silver dollars payable to the bearer on demand. It circulates as money.

Silver Fir, in botany, the *Abies* (or *Picea*) *pectinata*, the *Pinus picea* of Linnæus. It is named from its silvery-white bark. Leaves arranged in two rows, with their points turned upward; the tree very elegant. It is a native of Central Europe, where it sometimes reaches 100 feet high. It yields Strasburg turpentine.

Silver Fish, a fish of the size of a small carp, having a white color striped with silvery lines. It is a variety of the *Cyprinus auratus*, or gold fish.

Silver Fox, in zoölogy, a variety of the Virginian fox, *Vulpes fulcus*, to which specific distinction was formerly given as *V. argentatus*. When adult, the fur is of a deep glossy black (whence it is also called the black fox), with a silvery grizzle on the forehead, and on the flanks passing upward to the rump. It is extremely rare, and the fur is very valuable.

Silver Glance, a valuable ore of silver; composed of 87.1 per cent. of silver, and 12.9 sulphur. It is of a blackish-gray color, but acquires a superficial iridescent tarnish on exposure; opaque, with a metallic luster; flexible, but difficultly frangible; malleable and sectile, yielding easily to the knife, and cutting like lead. It is found in various cubical forms.

Silvering, the application of silver leaf to baser metals. Several mixtures containing silver have long been in use for coating base metallic objects, but they have been almost all superseded by the modern process of electroplating. For the silvering of mirrors, see MIRROR.

Silver Mountain, in Assyrian mythology, a mountain corresponding to the Grecian Olympus. The epithet "silver" was doubtless suggested by some snowy, inaccessible peak, the supposed dwelling place of the gods.

Silver Purple, in chemistry, a purple-brown compound obtained by adding stannous nitrate to a dilute neutral solution of argentic nitrate. It contains silver, tin, and oxygen, and is probably an argentous stannate.

Silver Question. See BIMETALLISM: BRYAN, WILLIAM JENNINGS; MCKINLEY, WILLIAM.

Silver Streak, The, a poetical designation of the English Channel. See SLEEVE, THE.

Silver Thames, the river Thames, thus often alluded to by old English writers.

Silvester I., Pope, elected in 314. The Arian heresy commenced in his pontificate, and he distinguished himself against the Donatists. He died 336.

Silvester II., was at first a monk in Auvergne, but his superior talents exciting the envy and hatred of his companions, he withdrew from the monastery and went to Spain. The Duke of Barcelona took him to Italy where he was noticed by the Em-

peror Otho, who gave him an abbey, which he afterward quitted, and preeeding to Germany became preeeptor to Otho III. He was afterward tutor to the son of Hugh Capet, by whom he was made Arehbishop of Rheims. By the interest of Otho he gained the papaey in 999. He was a man of considerable learning, partieularly in the mathematical sciences. He died in 1003.

Silybum, a genus of plants, order *Asteraccæ,* the most familiar of which is *S. marianum,* the mill thistle, which grows to the height of three or four feet or more, with large spreading wavy spinous leaves, of which those next the root are pinnatifid and variegated with green and milk-white. The speeifie name "marianum" was given to this plant to preserve the legend that the white stain on the leaves was caused by the falling of a drop of the Virgin Mary's milk.

Simarubaceæ, in botany, quassaids; an order of hypogynous exogens, allianee Rutales. Trees or shrubs with exstipulate, alternate, mostly eompound leaves; pedunеles axillary or terminal; flowers whitish, green, or purple; ealyx in four or five divisions, imbrieated; petals the same number; stamens twiee as many as the petals, eaeh arising from the back of a hypogynous seale; ovary stalked, four or five lobed, four or five eelled, each eell with one suspended ovule. Fruit of four or five drupes. Intensely bitter plants from the tropies of both hemispheres. Tribes four: Simarubeæ, Harrisonieæ, Ailantheæ, and Spathelieæ. Genera 17; number of speeies doubtful.

Simcoe, a lake in the province of Ontario, Canada. It is about 30 miles long, and 18 miles broad, situated between Lake Ontario and the arm of Lake Huron called Georgian Bay, into whieh it diseharges its waters through Lake Gongichin and the Severn. It eontains numerous islands, and is generally frozen over in the winter, so as to be passable with safety for sleighs.

Simeon, in Seripture, the seeond son of Jaeob and Leah; born about 1755 B. C. When he and his brethren went into Egypt to buy eorn, his brother Joseph insisted on Benjamin, the youngest brother, being brought to him, and detained Simeon as a hostage for his fortheoming. He gave his name to one of the Twelve Tribes, which dwelt to the N. of the territory oeeupied by the tribe of Judah.

Simeon, Charles, an English preacher; was born in Reading, Berkshire, Sept. 24, 1759; was edueated at Eton and King's College, Cambridge; was eleeted to his lifelong fellowship at his college in January, 1782; that same year took orders; and immediately after was appointed Perpetual Curate of Trinity Chureh, Cambridge, an office whieh he held till the close of his life, Nov. 13, 1836. As early as 20 he had been eonverted through reading Bishop Thomas Wilson's book on the Lord's Supper and as a preacher he was distinguished for an impassioned evangeliealism that at first aroused a bitter and protraeted opposition. But he made many eonverts, and came to exereise an enormous influence not only in Cambridge, but all over England. He took a foremost part in the work of founding the Chureh Missionary Society, and it was mainly his influence that sent the sainted Henry Martyn to India. Simeon paid several visits to Scotland, first in 1796, when he preaehed freely in the pulpits of the Chureh of Scotland — the Moderate majority in the General Assembly prevented this on his seeond visit in 1798 — rode over a great part of the country and climbed Ben Lomond with James Haldane, the pair conseerating themselves anew to God at the top. Simeon's eonversation eireles at Cambridge were famous in his day, and his old age was untroubled and full of honor. His influence long survived his death by means of the soeiety he established for purchasing advowsons. Simeon's "Horæ Homileticæ" (17 vols. 1819–1828; new ed. 21 vols. 1832–1833) contain as many as 2,536 sermon outlines.

Simeon, surnamed STYLITES, a Christian fanatie who aequired immense fame by passing the last 47 years of his life on the tops of ruined pillars. He flourished, if such a word is at all applicable to him, from 392 to 461. A seeond saint of the name dwelt on his pillar 68 years, but the former was the original inventor of this pastime.

Simeto. See GIARRETTA.

Simferopol, a town of Southern Russia; in the Crimea; capital of the provinee of Taurida; on the Salghir, 49¾ miles N. E. of Sebastopol. It consists of a European and a Tartar quarter (Ak-Metched), and is surrounded by produetive gardens and orchards. It has several churehes, four mosques, large barraeks, and government buildings, and exports a great quantity of fruit.

Simiadæ, the name of a quadrumanous family of mammalian animals, which embraces the most highly developed forms of the monkeys. They are all of them inhabitants of the old world. The nostrils are divided by a narrow septum; they possess opposite thumbs on their fore and hind feet; the callosities on the rumps are generally naked. Some of the speeies only are furnished with eheek pouches. The Simiadæ are divided into two groups: (1) The tailless, or apes, comprising the ehimpanzee, the gorilla, and the orang outang; (2) The tailed monkeys, including all the true monkeys of the old world.

Simile, in rhetoric, a figure by which two things are considered with regard to a third that is common to both. Similes serve two purposes: when addressed to the understanding, their purpose is to instruct; when to the heart their purpose is to please. To have a just notion of similes they must be distinguished into two kinds; one common and familiar, as where a man is compared to a lion in courage, and another more distant and refined, as where two things which have in themselves no resemblance or opposition are compared with respect to their effects; as where a comparison is instituted between a flower and a song, with reference to the emotions they produce in the mind.

Simla, the chief town of a district of the same name in the Punjab, and the most important hill sanitarium in British India; about 98 miles N. N. E. of Umballa; 7,156 feet above the sea. Situated on a series of wooded hill ridges, covered with deodars, rhododendrons and an innumerable variety of ferns, and with an equable temperature that rarely exceeds 70°, Simla is a perfect elysium to Anglo-Indians who have come from the burning plains of Hindustan or the swamps of Bengal. For many years it has been the permanent headquarters of the supreme government of India for more than six months of the year. The governor-general and the commander-in-chief annually remove hither with their entire staff from Calcutta, and even the "Gazette of India" is printed here during their residence. This tract of hill country was first acquired by the British in 1816, as a result of the Gurkha war, and has since been augmented by purchase, lapse, and exchange. The first house was built in 1819; Lord W. Bentinck was the first governor-general to select it as his summer quarters. There are now churches, schools, hotels, clubs, bank, and breweries; and all the environs are dotted with picturesque villas. The chief schools are the Roman Catholic Orphanage for the children of soldiers, on the model of the Lawrence asylums; the Mayo industrial schools for the orphans of poor civilians; Bishop Cotton's school and the Punjab girls' school, both for the higher education of the children of well-to-do Europeans. The district of Simla which is entirely surrounded by petty native States has an area of 18 square miles, of which only about 12 are cultivated. The crops are wheat, Indian corn, ginger, and poppy. There is one small tea-garden, and great efforts are being made to grow hops. The neighboring mountains yield lead, iron, and slate. Pop. (1901) town, 14,505; district, 50,000.

Simmons, Franklin, an American sculptor; born in Webster, Me., Jan. 11, 1839; first came into prominence in 1865–1866 when, at Washington, D. C., he produced several life-size bronze medallions of the members of the cabinet and prominent army and navy officers. In 1868 he went to Rome, Italy. He has executed about 100 portrait busts in marble, about 15 public monuments, including statues of General Grant and Roger Williams in the National Capital, and numerous ideal statues, busts, etc.

Simms, William Gilmore, an American author; born in Charleston, S. C., April 17, 1806. His publications include: "Atalantis: A Tale of the Sea" (1832), the longest and most noted of his poems; "The Yemassee" (1835; revised ed. 1853); "Castle Dismal" (1845); "The Wigwam and the Cabin; or, Tales of the South" (1845–1846); "The Maroon, and Other Tales" (1855); and "War Poetry of the South" (1867). He died in Charleston, June 11, 1870.

Simnel, Lambert, an impostor who was put forward by a party of malcontent leaders of the York faction early in the reign of Henry VII. He was trained to personate Edward Plantagenet, Earl of Warwick, son of the murdered Duke of Clarence. Simnel was crowned at Dublin, and landed with his followers in Lancashire. They were totally defeated near Newark, June 16, 1487, when most of the leaders in the recent rebellion perished. Simnel ended his days as a domestic in the royal service.

Simnel Cake, a raised cake, with a crust colored with saffron, the interior being filled with the materials of a very rich plum pudding. They are made up very stiff, boiled in a cloth for several hours, then brushed over with egg and baked over a quick fire.

Simocyon, in palæontology, a genus of *Carnivora*, sometimes placed with the *Canidæ*, but of doubtful affinities, from the Upper Miocene of Greece. It was about the size of a small panther, but had "the canines of a cat, the molars of a dog, and the jaws shaped like those of a bear."

Simoda (lowland), a port at the extremity of Cape Idzu, on the S. coast of the island of Nipon, Japan; 67 miles S. W. of Yokohama. It was thrown open to European commerce in 1857. It is subject to earthquakes, by one of which, in 1854, it was frightfully desolated.

Simon, Jules François, a French statesman; born in Lorient, Morbihan, Brittany, Dec. 27, 1814; was a disciple of Victor Cousin, the great French philosopher, and when 25 years of age succeeded him in the chair of philosophy at the Sorbonne. After the revolution of 1848 he was elected to the assembly from the Côtes-du-Nord, taking a seat with the Moderate Left. In

March, 1849, he was elected to the Council of State, and resigned his seat as deputy in April, to devote himself to lectures and the editing of "La Liberté de Penser." In 1863 he was elected to the Corps Législatif, where he served till the fall of the empire, when he was placed with Thiers and Gambetta at the head of the provisional government, whose affairs he administered during the siege. From the conclusion of peace in 1871 till the fall of Thiers he was prominent in the Assembly at Bordeaux and at Versailles, and in 1875 was elected a life senator. He was the senior representative of France at the Labor Congress of Berlin convoked by the Emperor William II.; was made permanent secretary of the Academy of Moral and Political Sciences in 1882, and from 1875 was a member of the French Academy. He died in Paris, France, June 8, 1896.

Simonides, a Greek lyric poet; born in the island of Ceos, 556 B. C. He lived at Athens during the reign of Hipparchus and spent his last years at the court of Hieron of Syracuse. Simonides especially excelled in the elegy and epigram, was the contemporary of Æschylus, Pindar, and Lasus of Hermione, won very numerous prizes, and even defeated Æschylus by his elegy on the heroes who fell at Marathon. Only fragments of his poems are extant. Simonides made poetry his profession, and is said to have been the first poet who wrote for pay. He was also in repute as a philosopher, and is said to have added four letters to the Greek alphabet. He died 467 B. C.

Simon Richard, the father of Biblical criticism; born in Dieppe, France, May 13, 1638. He entered the Congregation of the Oratory in 1659, but soon after withdrew, to return in the later part of 1662. He was sent first to lecture on philosophy in the college of Juilly, but was afterward appointed to catalogue the Oriental MSS. in the library of the Order of Paris. His criticisms on Arnauld's "Defense of the Perpetuity of the Faith in the Blessed Eucharist" caused great displeasure among the Port-Royalists, and his imprudent meddling with another controversy brought on his head the wrath of the Benedictines. The scandal occasioned by the appearance of his "Critical History of the Old Testament" (1678) led to his again withdrawing from the Oratory and retiring to Belleville as curé. In 1682 he resigned his parish and lived in literary retirement at Dieppe, Paris, and again at Dieppe, where he died April 11, 1712.

Few writers of his age played so prominent a part in the world of letters, and especially in its polemics. There is hardly a critical or theological scholar among his contemporaries with whom he did not break a lance — Weil, Spanheim, Le Clerc, Isaac Voss, Du Pin, Jurieu, and Jurieu's great antagonist, Bossuet. His "Critical History" (suppressed through Bossuet's influence, and only printed entire at Rotterdam in 1685) anticipates the most important conclusions of all the later rationalistic scholars of Germany, and also their method of investigation, and, indeed, is the first work which treated the Bible from the point of view of a literary product. For example, he disproves the Mosaic authorship of the Pentateuch, assigning its composition to the scribes of the time of Ezra.

Other writings of Simon's are: "Critical History of the Text of the New Testament" (1689); and "Critical History of the Principal Commentators of the New Testament" (1693), in which he assails the theology of the Fathers, and particularly that of Augustine, as a departure from the simple and less rigid doctrines of the primitive Church. Among the Fathers his most esteemed authority was Chrysostom. Bossuet replied to this last work by his "Defense of the Tradition of the Holy Fathers." Simon frequently published under assumed names — as his "Critical Dissertation" on Dupin's "Library of Ecclesiastical Writers," under the name of Jean Reuchlin; a work, "Critical History of the Credits and Customs of the Nations of the Levant," under the anagram of Monis; and a "History of the Origin and Progress of the Ecclesiastical Revenues," under the name of Jerome Acosta.

Simonds, Frederic William, an American geologist; born in Charlestown, Mass., July 3, 1853; was graduated at Cornell University in 1875; was instructor of Geology and Palæontology there in 1875–1877. He held the professorship of botany, geology, and zoölogy at the University of North Carolina in 1877–1881, and that of geology and biology at the University of Arkansas in 1887–1890; and accepted the chair of geology at the University of Texas in 1895. His publications include: "Annual Report of the Geological Survey of Arkansas" (1888); "Annual Report of the Geological Survey of Arkansas" (1891); "A Record of the Geology of Texas for the Decade ending Dec. 31, 1896" (1900); etc.

Simon Magus, or **The Magician,** a heresiarch, who is supposed to have been the founder of the Gnostic sect. He was a native of Samaria, and perceiving the miracles wrought by Philip the Deacon, he was baptized; but, on offering money to the apostles that he might receive the Holy Ghost, or the gift of tongues, and of working miracles, he was excommunicated by St. Peter. It is from this circumstance that the term Simoniac is applied to such as purchase spiritual things. He afterward fell into the grossest errors, and maintained

that God has left the world to be governed by certain beings called Æons.

Simonton, Charles H., an American jurist; born in Charleston, S. C., July 11, 1829; was graduated at the South Carolina College at the head of his class. He then studied law and practised in his native city; was a member of the Legislature of South Carolina in 1858–1886, excepting the periods of the Civil War and reconstruction. He joined the Confederate army in 1861; was captain of the Washington Light Infantry, and afterward colonel of the 25th South Carolina Volunteers. During the latter months of the war he was a prisoner at Fort Delaware. In 1886–1893 he was United States district judge of the District of South Carolina. His publications include: "Lectures on Jurisdiction and Practice of United States Courts"; "Digest of the Equity Decisions, State of South Carolina" (1857); and "The Federal Courts, Organization, Jurisdiction and Procedure" (1898). He died April 25, 1904.

Simony (so called from its resemblance to the sin of Simon Magus) in English law, an offense consisting in the presentation to an ecclesiastical benefice for a reward. By 31 Eliz. c: 6, a simoniacal presentation is declared void, and two years' value of the benefice forfeited, one-half of the forfeit to go to the crown, the other half to the person suing; and the person accepting the benefice is forever debarred from holding it. An act of George IV., however, legalizes engagements for the resignation of ecclesiastical preferments in favor of one of two persons specially named, being by blood or marriage an uncle, son, grandson, brother, nephew, or grand-nephew of the patron. The bond must be entered into before the presentation, and entered in the registry of the diocese. The resignation in terms of the bond will be void unless one of the presentees named in it is presented within six months after notice of resignation has been given to the patron.

Simoom, a noxious hot wind which occurs in most countries situated at no great distance from sandy deserts, and which always blows from that quarter in which the desert is situated. In Senegambia and Guinea it blows from the N. E. in the delta of the Nile from the S. W., and the E. shores of the Gulf of Suez from the N. E., in Syria from the S. E., at Mecca from the E., at Bagdad from the W., and at Surat from the N. The approach of the simoom is indicated by terrible appearances. The E. horizon is pervaded by a dull yellow hue; a thick sulphurous exhalation rises from the ground, which is first hurried round in rapid gyrations, and then ascends into the air covering the whole heavens. Hissing and crackling sounds are heard; and a hot current of air rushes over the ground. There is generally a considerable quantity of fine sand in the hot air, and the wind affects the human body very powerfully, often producing great feebleness and sometimes even death.

Simplon, a mountain of the Alps, in the S. of Switzerland, separating the canton of Valais from the Piedmontese territory. The old road across it being impracticable for heavy carriages, a new one, called the Route of the Simplon, was formed by order of Napoleon I. at the joint expense of France and the kingdom of Italy. Though the ascent is everywhere gradual, the highest point of the road is nearly 6,600 feet above the level of the sea. The length is 38 miles, and the width between 25 and 30 feet. It is carried through several tunnels, over upward of 600 bridges, and has 20 station houses for travelers. The road of the Simplon long regarded as one of the greatest feats accomplished by modern engineering has become of less importance since the formation of a railroad. The Simplon tunnel now in construction will be larger than either that of St. Gothard or Mt. Cenis.

Simplon Tunnel, a tunnel through the Alps, designed to give France and Switzerland direct communication by rail with Milan, the greatest distributing point in Italian trade. Among Italians it is believed that the tunnel will double the commerce of Genoa and make that city, instead of Marseilles, the first among the Mediterranean ports. Work was begun on the tunnel on Nov. 13, 1898. The contract called for its completion in 5½ years, and the price to be paid was 69,500,000 francs ($13,413,500). It has a total length of 20 kilometers (12.4 miles), and thus is the longest tunnel in the world. This great passageway is the third one connecting Italy with outlying countries by direct rail, and will accomplish a saving of 77 kilometers (43.5 miles), or from 7 to 8 per cent. on travel from Paris to Milan, as compared with the Mount Cenis or St. Gothard tunnels. The Mount Cenis tunnel has a length of 13 kilometers (8 miles) and the St. Gothard a length of 15 kilometers (9.3 miles).

When in the fifties the wonderful project of drilling the Mount Cenis tunnel was undertaken, fathered by the courageous Italian Minister of State, Cavour, no machines for drilling were in existence, and it was calculated that a period of 20 years would be necessary for every 5 kilometers (3.1 miles) of tunnel drilled. Then Engineer Sommeillier, in charge of the work, constructed the first drilling machine, and, though crude, it was satisfactory enough to accomplish 10 times the work done by manual labor, and enabled him to finish the tunnel in 11 years. The St. Gothard tunnel was finished in from eight to nine years.

The Simplon tunnel begins in Switzerland near the little town of Brig, in the valley of

the Rhone, Canton Wallis, and ends in the valley of the Diveria, on the Italian side, near Isella. It is built perfectly straight, except for a small curve at the ingress and egress. The contract for the tunnel provided for a fine of 5,000 francs ($965) per day if the time limit was exceeded, while an equal gratuity per day was to be given if it was finished before the stipulated period.

The fundamental principle in tunneling always has been to drive the hole, excavate, and follow it up with the finishing masonry, making provision, of course, for ventilation, which is generally sufficient at first, but which becomes insufficient when the work progresses toward the center, when the incoming fresh air mixes with the outgoing gases. The method employed by Engineer Brandt, who was in charge of the undertaking from its beginning till his death on Nov. 22, 1899, was to drive two holes parallel within the radius of the excavations, leaving a dividing wall, one hole being excavated about 17 meters (55¾feet) in advance of the other. These are built for a single track, and later on the dividing wall can be broken through for double tracks if necessary. At distances of about 200 meters (656 feet) transverse connections between the tunnels are made through the dividing wall and are provided with doors. To obtain sufficient ventilation, powerful air blasts are blown into one side of the tunnel, which return through the other side of the divide, and thereby conduct outward all foul air and bad gases. When the air in the interior increases in heat, it is cooled by showers of cold water, which has been led from the exterior of the mountain under high pressure. Through practical experiments in the mines of Spain, Engineer Brandt proved that air at 50° C. (121° F.) by this means can be reduced to 15° C. (59° F.). These same streams furnished 1,000 horse-power for driving drills. The miners, therefore, always worked in an artificial atmosphere of cool, fresh air.

Engineer Brandt's invention was a hydraulic rotary drilling machine, by which it was hoped to complete the tunnel in less than contract time. It was used singly and in battery form. Prominent engineers came from far and near to examine this powerful mechanism. Another of Mr. Brandt's inventions was a machine for loosening and removing the débris after the explosions and blasts. It throws a powerful stream of water in a jerky manner into the stones loosened by the force of the blasts, thereby washing away the dirt. This makes excavation easier. These machines run on rails, and when in use follow each other in rotation. The State Railroads museum in Vienna possesses the first hydraulic rotary machine invented by Brandt, used in 1867.

During November, 1899, in which 10 days were lost on account of the strike, there were drilled at the S. side 144 meters (472 feet) and at the N. side 123 meters (404 feet). The total up to Dec. 12, 1899, was about 2 1-5 miles. The actual piercing of the tunnel was finally accomplished on Feb. 24, 1905, and the first passenger train went through in 37 minutes, on Jan. 25, 1906.

Simpson, Edward, an American naval officer; born in New York city, March 3, 1824; took part in the Mexican and Civil Wars; and became a rear-admiral in 1884. He was the author of "Ordnance and Naval Gunnery" (1862) and other military books. He died in Washington, D. C., March 2, 1888.

Simpson, Sir James Young, a British physician; born in Bathgate, Linlithgowshire, June 7, 1811. At the age of 15 he proceeded to Edinburgh University, and in 1830 was licensed by the Royal College of Surgeons. In 1832 he graduated as M.D., and became assistant to Professor John Thomson. He was shortly afterward elected one of the presidents of the Royal Medical Society, and in 1835 he published a paper on diseases of the placenta, which was translated into different European languages. In 1839 he was appointed to the chair of midwifery in the University of Edinburgh. His first paper on chloroform was read before the Medico-Chirurgical Society of Edinburgh on March 10, 1847, and it soon came into general use. He received honors from numerous scientific societies in Europe and America, and in 1853 was elected a foreign associate of the Academy of Medicine of Paris. In 1856 he received the laureateship and gold medal of the French Academy of Sciences, with the Monthyon prize of $400 awarded for his "most important services done to humanity." In 1847 he was appointed her majesty's physician-accoucheur for Scotland; in 1856 he was made a knight of the royal order of St. Olaf of Sweden; and in 1866 a baronetcy was conferred on him. He died in Edinburgh, May 6, 1870.

Simpson, John Palgrave, an English dramatist; born in Norwich, England, in 1807. He wrote: "Second Love" (1846); "Gisela" (1847); "Letters from the Danube" (1847); "The Lily of Paris; or, The King's Nurse" (1848); "Pictures from Revolutionary Paris" (1848); "Life of Karl Maria von Weber." His dramatic compositions were about 40 in number; among them are "The World and the Stage," and "Sibylla; or, Step by Step." He died in London, Aug. 19, 1887.

Simpson, Matthew, an American clergyman; born in Cadiz, O., June 20, 1810; tutor in Madison (now Allegheny) College in his 19th year; was graduated in medicine in 1833, and soon after entered the

ministry in Pittsburg Conference; elected vice-president and professor in Allegheny College, 1837; elected president of Indiana Asbury University, 1839; elected editor of the "Western Christian Advocate" 1848. In 1852 he was elected bishop. He was delegate to the Irish and British Conferences and the Evangelical Alliance at Berlin, and extended his travels through Greece, Turkey, Egypt, and the Holy Land. During the Civil War he delivered numerous addresses in behalf of the Union and the freedmen, and officiated at the funeral of President Lincoln. In 1874 he visited Mexico, and later presided at the conferences in Europe; and in 1881 visited Europe for the third time as delegate to the First Methodist Ecumenical Council and delivered the opening address. He was the author of "A Hundred Years of Methodism," and of the "Cyclopedia of Methodism." He was one of the most eminent pulpit orators of the century. He died in Philadelphia, Pa., June 18, 1884.

Simpson College, a coeducational institution in Indianola, Ia.; founded in 1867 under the auspices of the Methodist Episcopal Church; has productive funds exceeding $145,000; grounds and buildings valued at over $145,000; scientific apparatus, etc., $25,000; volumes in the library, about 4,500; average number of faculty, 35; average students, 900; graduates since opening, over 500; ordinary income, $30,000.

Simrock, Karl Joseph, a German poet; born in Bonn, Germany, Aug. 28, 1802. He studied at the university of his native city and at Berlin, and in 1826 entered the Prussian State service. His first work was a translation into modern German of the "Nibelung Song." Soon after the publication of his translation of Hartmann von der Aue's "Armer Heinrich" (1830) he was compelled to leave the Prussian service on account of a revolutionary poem which he had written. Afterward he devoted himself exclusively to literature, and more particularly to the early literature of his own country, which he modernized in excellent style. Besides these editorial labors he translated Shakespeare's poems and some of his plays, and published "Sources of Shakespeare in Novels, Tales and Sayings" (3 vols. 1831 in conjunction with Echtermeyer and Henschel); "Sources of Italian Stories" (1832); a collection of German "Folklore" (13 vols. 1844–1867), comprising national proverbs, songs, and riddles, besides a vast quantity of stories; "The Book of Heroes," partly translations and partly original poems (6 vols. 1843–1849) illustrative of the heroic traditions of the Teutonic race; his own "Poems" (1844); and a considerable number of handbooks. In 1850 he was appointed Professor of Old German Language and Literature at Bonn, a post which he held till his death, July 18, 1876.

Sims, George Robert, an English dramatist; born in London, Sept. 2, 1847. He wrote "The Lights o' London" (1882); "The Romany Rye" (1883). Some of his contributions to the press are: "Dagonet Ballads" (1879); "Three Brass Balls" (1880); "The Theater of Life" (1881); "How the Poor Live" (1883); "Stories in Black and White" (1885); "Mary Jane's Memoir" (1887); "Grey Mare," "The Elixir of Youth," "In London Town," "Gipsy Earl," etc.

Sims, James Marion, an American surgeon; born in Lancaster, S. C., Jan. 25, 1813; studied medicine at Charleston and Philadelphia, and having begun practice had his attention specially drawn to some of the special diseases of women, for which he gained a distinguished name, introducing new instruments and operations. He was instrumental in getting a woman's hospital established in New York; subsequently practised for some years in Europe; and had charge of a large hospital at Sedan after the disaster to the French there in 1870. He died in New York city, Nov. 13, 1883.

Sims, Winfield Scott, an American inventor; born in New York city, April 6, 1844; was graduated at the Newark (N. J.) High School in 1861, and served during the Civil War in the 37th New Jersey regiment. Subsequently he turned his attention to the investigation of electric apparatus; constructed an electric motor by means of which he was enabled to propel a 16-foot boat at the rate of 4 miles an hour; was the first to apply electricity to the propulsion and guidance of movable torpedoes, and later devised a dynamite boat with a speed of 18 miles an hour, to be used in the harbor and coast defense service.

Simson, Robert, a Scotch mathematician; born in Kerton Hall, Ayrshire, Oct. 14, 1687; was educated at the University of Glasgow with a view to entrance into the Church, but, finding theology uncongenial, he devoted himself to mathematics, and specially to geometry. In 1711 he was appointed Professor of Mathematics in Glasgow, and he occupied this chair for half a century. One of the first subjects to which he turned his attention was the restoration of Euclid's lost treatise on "Porisms." This had been previously attempted, but without success, owing to Pappus' meagre and obscure description of what a porism was. It is Simson's greatest achievement that he elucidated the nature of the ancient porisms, though his restoration of them is not complete. A specimen of his discovery was printed in the "Philosophical Transactions" of the Royal Society of London in

1723, but his treatise on the subject did not appear till after his death. His "Sectiones Conicæ," in five books, was published in 1735; the first three books were afterward translated into English, and have been repeatedly printed. His restoration of Apollonius' "Plani Loci" had been finished about 1738, but was not published till 1749. The work by which he is best known is his "Elements of Euclid," which appeared both in Latin and English in 1756. In 1776 a large volume, "Some Additional Works of Robert Simson," was printed at the expense of Earl Stanhope, one of Simson's intimate friends, and liberally distributed. He died Oct. 1, 1768.

Simulium, in entomology, the sand fly, a genus of *Bibionidæ* or of *Tipulidæ*. They resemble mosquitoes, and their bite often produces very painful swellings. The larva lives on the sub-aquatic stem of Phellandrium and Sium, to which also it attaches its cocoon, etc. Other species inhabit South America, Lapland etc. One, *S. columbatschense*, swarms along the Lower Danube, and bites so severely as sometimes to injure cattle fatally.

Simultaneous Equations, in mathematics, two equations are simultaneous when the value of the unknown quantities which enter them are the same in both at the same time. A group of equations is simultaneous when the value of the unknown quantities is the same in them all at the same time.

Sin, a condition that is not simply moral evil as recognized by the awakened human conscience, but guilt before God or the gods. Some doctrine of sin, and of the mode of averting the anger of the deity, of reconciling him, and of escaping from the guilt, is accordingly part of most religions, ancient and modern. Zoroastrianism is a conflict of sin and holiness. The central doctrine of Buddhism turns on the demerit of human actions and human life, which must be purged by transmigration. But in no sacred books is the sense of sin so keen and developed as in the Bible — in the writings of the prophets of the God of holiness, in the psalms, in the Gospels, and in Paul's epistles. From Paul's various utterances on the great subject of sin the latest Christian doctrine professes to be but a development.

Throughout the Scriptures sin appears as that element in man which puts him at enmity with God, and for his salvation requires the work of a Redeemer (see CHRISTIANITY). Sin is not defined in Scripture, and it was not till the controversies between Pelagius and Augustine, at the end of the 4th century, that the doctrine received full development. The early Greek fathers regarded sin as opposition to the will of God, and as such involving death as its just penalty. But they did not affirm that the guilt of Adam's sin or the corruption of his nature descended to all mankind. Tertullian, in virtue of his doctrine of TRADUCIANISM (*q. v.*), was bound to hold that sinfulness had been propagated from Adam to his descendants. But it was reserved for Augustine to maintain, against Pelagius, that Adam's sin completely corrupted his whole nature; that the corruption of his guilt and its penalty death pass to all his children; that man is born not merely corrupt, but in a state of sin, guilt, and liability to punishment; in virtue of Adam's *peccatum originale*, the offspring of Adam is a *massa perditionis*, incapable of knowing, or loving, or serving God, and naturally disposed, without grace, to pursue evil only, the will being enslaved to evil. PELAGIUS (*q. v.*) maintained contrary doctrines, and semi-pelagianism insists that in spite of the weakening of his powers through hereditary sinfulness man is yet not wholly inclined to evil. The Greek Church continued to deny hereditary guilt, and to affirm man's will as free as Adam's before the fall. Duns Scotus and his followers admitted that man had lost by Adam's fall *justitia originalis*, but laid stress on the freedom of the will. Thomas Aquinas taught that hereditary sin is truly sin, and the unbaptized infant is damned. At the Reformation both Luther and Calvin asserted what they regarded as Augustinian and Pauline views. Zwingli looked on hereditary sin as an inherited evil or disease; Arminians and Socinians practically denied hereditary sin altogether. In modern German speculation the Hegelians taught that sin was a necessary condition of the development of mankind; and Schleiermacher that the sinful state of man was a disturbance of his nature, not a necessary condition of it. The problems connected with sin are closely akin to those connected with the origin of evil and the freedom of the will.

The doctrine of the Thirty-nine Articles (Art. ix.) is as follows: "Original sin standeth not in the following of Adam (as the Pelagians do vainly talk); but it is the fault and corruption of the nature of every man, that naturally is engendered of the offspring of Adam, whereby man is very far gone from original righteousness, and is of his own nature inclined to evil, so that the flesh lusteth always contrary to the spirit; and therefore in every person born into this world it deserveth God's wrath and damnation."

The Westminster Confession teaches (chap. vi.): "By this sin" (*i. e.*, the eating of the forbidden fruit) "they" (*i. e.*, our first parents) "fell from their original righteousness and communion with God, and so became dead in sin, and wholly defiled in all the faculties and parts of soul

and body. They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and corrupted nature conveyed to all their posterity, descending from them by ordinary generation. From this original corruption, whereby we are utterly indisposed, disabled, and made opposite to all good, and wholly inclined to all evil, do proceed all actual transgressions."

Sins have been divided into categories, as sins of omission and of commission, deliberate voluntary sins and involuntary sins, sins of infirmity, etc. The "sin unto death" (I John v: 17), generally identified with the unforgivable "blasphemy against the Holy Spirit" (Matt. xii: 31), or "sin against the Holy Ghost," is understood not to mean profane speaking against the person of the Holy Spirit, or resisting His operations, but a state of obstinate, malignant deadness of heart, and unrepentant and unhesitating hatred to all good.

Sinai, a mountain, or mountain range, in Arabia Petræa, in the peninsula formed by the two arms of the Red Sea, and rendered memorable as the spot where, according to the Pentateuch, the law was given to Israel through Moses. This mountain pass is divisible into three groups: a N. W., reaching, in Mount Serbal, an elevation of 6,340 feet; an E. and central, attaining, in Jebel Katherin, a height of 8,160 feet; and a S. E., whose highest peak, Um Shaumer, is the culminating point of the whole Sinaitic range. Serbal, with its five peaks, is the most magnificent mountain in the peninsula, and is identified with Sinai by the earlier Church fathers, Eusebius, Jerome, Cosmas, etc.; but it does not meet the requirements of the Hebrew narrative, and even as early as the time of Justinian the opinion that Serbal was the Sinai of Moses had been abandoned, and to a ridge of the second or E. range that honor had been transferred, the N. summit of which is termed Horeb; and the S. Jebel Mûsa, or Mount of Moses, continues to be regarded by the great majority of scholars as the true Sinai. Its height is variously estimated at from 6,800 to 7,100 feet above the sea. It is separated from the Jebel-ed-Deir on the W. by a narrow valley, called Er-Rahah, on one of the steps of which stands the famous convent of Mount Sinai, devoted to St. Catherine. In many of the Western Sinaitic valleys the more accessible parts of the rocky sides are covered by thousands of inscriptions, usually short, and rudely carved in spots where travelers would naturally stop to rest at noon, frequently accompanied by a cross and mingled with representations of animals. The inscriptions are in unknown characters, but were at first ascribed to the ancient Israelites on their way from Egypt to Sinai, and afterward to Christian pilgrims of the 4th century. Recently, however, many of them have been deciphered by Professor Beer of Leipsic, who regards them as the only known remains of the language and characters once peculiar to the Nabathæans of Arabia Petræa. Those thus far deciphered are simply proper names, neither Jewish nor Christian, preceded by some such words as "peace," "blessed," "in memory of."

Sinaitic Codex, a Biblical MS. written on vellum, and containing a large portion of the Septuagint, with the apocryphal books, the whole of the Greek New Testament, with the epistle of Barnabas and a fragment of the Shepherd of Hermas. It was discovered in a convent at Mount Sinai by Tischendorf in 1844–1859, and at his suggestion presented to Alexander II. of Russia, who caused it to be published in 1862. It probably dates from the 4th century.

Sinaloa, one of the Pacific States of Mexico; area of 36,167 square miles; pop. (1900) 296,701. It contains over 100 mining districts, chiefly producing silver. The capital is Culiacan 100 miles N. W. of which is the small town of Sinaloa; pop. 2,000.

Sinamine, in chemistry, a basic compound discovered in 1839 by Robiquet and Bussy, prepared by rubbing together a mixture of one part thiosinamine and five parts mercurie oxide, exhausting with ether, evaporating, dissolving the viscid mass in boiling water, and allowing it to crystallize. It forms white, shining, trielinic prisms, which melt at 100°, is very bitter to the taste, inodorous, and dissolves in water, alcohol, and ether. Its aqueous solution has an alkaline reaction, and is precipitated by tannic acid. With nitrate of silver it forms a resinous precipitate. Symbol

$$C_4H_6N_2 = \left.\begin{matrix} CN \\ C_3H_5 \\ H \end{matrix}\right\} N.$$

Sinapis, in botany, the mustard, a genus of plants, order *Brassicaceæ*. The seeds of two species are commonly used for culinary and medicinal purposes. The seeds of *S. nigra* are of a dark reddish-brown color, and are known as black mustard seeds; those of *S. alba* are of a yellowish color, and are termed white mustard seeds. The flour of mustard, so extensively used as a condiment, is prepared from a mixture of the two kinds, usually in the proportion of two parts black and three parts white. The seeds are pounded, and the husks then removed from the flour by sifting. Both the black and white mustard seeds contain a large quantity of bland fixed oil, resembling rape, which is readily obtained by submitting them to pressure. It is remarkable that the pungent principle for which mustard is valued does not exist in the seeds,

but it is produced when the constituents of the seeds are brought together under the influence of water. The acrid and pungent volatile oil of mustard is obtained by distilling black mustard seeds with water. Internally, flour of mustard is used as a stimulant, diuretic, and emetic; externally, as an irritant and rubefacient. White mustard seeds are often taken in an entire state as stimulants in dyspepsia. The young herbs, with their seed-leaves, are commonly used in salads.

Sinclair, originally St. Clair, a Scotch family of Norman origin, founded by William de Santo Claro, who settled in Scotland and received from David I. the grant of the barony of Roslin. The earldoms of Orkney, of Caithness, and of Rosslyn have been especially connected with this family, which at one time was one of the most powerful in the kingdom.

Sinclair, Catherine, a Scotch novelist; born in Caithness, Scotland, April 17, 1800. Among her writings are: "Charlie Seymour"; "Holiday House"; "Modern Accomplishments," a study of the education of girls, (1836); "Shetland and the Shetlanders" (1840); "Modern Flirtations" (1841); "Scotch Courtiers and the Court" (1842); "Jane Bouverie; or, Prosperity and Adversity" (1846); "Popish Legends; or, Bible Truths" (1852); "Torchester Abbey" (1857); "Anecdotes of the Cæsars" (1858); "Sketches and Short Stories of Scotland" (1859). She died in Caithness, Aug. 6, 1864.

Sinclair, Sir John, a Scotch agriculturist; born in Thurso Castle, Caithness, May 10, 1754; was educated at the Universities of Edinburgh, Glasgow, and Oxford. He was called to both the Scotch and English bars, but did not follow the profession of law. In 1786 he was created a baronet. He had already seriously engaged in inquiries on political subjects, and in 1790 he conceived the idea of that great national undertaking, "The Statistical Account of Scotland," a statistical and descriptive account of the whole country, parish by parish. After unwearied exertions in which he was ably seconded by the clergy the work was completed on Jan. 1, 1798. In 1793 Sir John advocated and obtained the establishment of a board of agricultural and internal improvement, of which he became president. In 1803 he published a "History of the Public Revenue of the British Empire," and also a pamphlet on longevity. The latter subject was afterward treated more fully in his "Code of Health and Longevity." This was followed in 1819 by his "Code of Agriculture." He died in Edinburgh, Dec. 21, 1835.

Sind, Sindh, or **Scinde,** a province of British India, in the N. part of the presidency of Bombay. It consists of the lower valley and delta of the Indus, and is bounded on the W. and N. W. by Baluchistan and Afghanistan; N. E. by the Punjab; E. by Rajputana; and S. by the Runn or Ran of Kach and the Indian Ocean; area, 47,789 square miles; Pop (1901) 3,210,910. It is divided into five districts, Haidarabad, Karáchi, Shikarpur, Thar, and Parkar, and Upper Sind Frontier, and also includes the native state of Khairpur (6,109 square miles). The chief city and port is Kurrachee or Karáchi, but the ancient capital Haidarabad is still a populous town.

Flatness and monotony are the great features of Sind. The only elevations deserving the name of mountains occur in the Kirthar range separating Sind from Baluchistan. The plain country comprises a mixed tract of dry desert and alluvial plain. The finest and most productive region lies in the neighborhood of Shikarpur, where a narrow island 100 miles long is enclosed on one side by the River Indus and on the other by the Western Nára. Another great alluvial tract stretches E. from the Indus to the Eastern Nára. Sand hills abound on the E. border, and large tracts rendered sterile for want of irrigation occur in other parts of Sind. Forests of *Acacia arabica* in some parts stretch along the banks of the Indus for miles, but the forests, as a whole are not extensive. The delta of the Indus contains no forests, but its shores and inlets abound with low thickets of mangrove trees. Herds of buffaloes graze on the swampy tracts of the delta, and sheep and goats abound in Upper Sind. The dryness of the soil, and the almost entire absence of rain, render irrigation very important. Thus the Indus is almost to Sind what the Nile is to Egypt. Numerous irrigation canals, drawn from the main river or its tributaries, intersect the country in every direction. The tilled land yields two crops annually; the spring crop consisting of wheat, barley, grain, oil seeds, indigo, hemp, and vegetables; the autumn crop of millet, sorghum (the two chief food grains in Sind), rice, oil seeds, pulse, and cotton. The native fauna includes the tiger, hyena, wild ass, wolf, fox, hog, antelope, and ibex. Domestic animals include camels, buffaloes, horses, sheep, and goats. Venomous snakes abound, and yearly cause a large number of deaths.

The river fisheries of the Indus supply the province with fresh fish, and afford a considerable export trade. The trade of Sind centers almost entirely on the great seaport of Kurrachee; the chief exports are raw cotton, wool, and grain of various kinds. The climate ranks among the hottest and most variable in India. The hot season lasts from March to September, the cold from October to March. About 78 per

cent. of the population are Mohammedans; 12 per cent. Hindus; 5 per cent. Sikhs; and the rest Christians, Jains, Parsees, Jews, Buddhists, etc. The natives are very ingenious as artisans. The leading textile fabrics are coarse silk, cotton, or mixed cloths.

The history of Sind is of little interest. It was subdued by the Mogul Emperor Akbar in 1580, since which period it has always been either nominally or really tributary. In 1739 it fell under the power of Nadir Shah, but on his death it reverted to the imperial sway of Delhi. From about the middle of the 18th century it was subordinate to Afghanistan. Civil dissension in the end of the 18th century led to the elevation of the Talpur dynasty of the "Ameers." The government then became a wholly unchecked military despotism, upheld by a feudal soldiery. The hostility displayed by the Ameers of Sind toward the British during and after their operations against the Afghans led ultimately to its invasion by British troops, and final conquest by Sir C. Napier's victory at Miani in 1843. Sir C. Napier was appointed its first governor, and it was soon after annexed to the presidency of Bombay.

Sindhia, Scindiah, the hereditary title of the head of a Mahratta dynasty ruling in Gwalior, which was founded in 1738 by Ranojee Sindhia, a chief who raised himself from obscurity by his own merits. He died in 1754. In 1781 Madaji Sindhia negotiated a peace between the British and the Mahrattas, and having introduced European discipline and tactics into his army, possessed himself of Delhi, Agra, and the person of the Mogul emperor, in whose name he subsequently acted. He was the most powerful member of the Mahratta confederacy. His successor Dowlut Rao Sindhia was defeated by Wellington at Assaye, and at Delhi and Laswari by Lord Lake. After his death in 1827 the State became disorganized, and order was only restored after the battles of Maharajpur and Punnair (1843), in which the British troops were victorious. The State was then constituted subsidiary to the British government. At that time the subsequent chief, Babajee Rao Sindhia, was a minor. He was loyal during the mutiny of 1857. In 1877 he was made a G. C. B., and in 1878 was invested with the Star of India.

Sine, in trigonometry, the straight line drawn from one extremity of an arc perpendicular to the diameter passing through the other extremity. If from any point on one side of a plane angle a perpendicular be let fall upon the other side, thus forming a right-angled triangle, the ratio of the hypothenuse of this triangle to the perpendicular is the sine of the angle. Arithmetic of sines, analytical trigonometry, the object of which is to exhibit the relations of the sines, cosines, tangents, etc., of arcs, multiple arcs, etc. Artificial sines, logarithms of the natural sines or logarithmic sines. Line of sines, a line on the sector, or Gunter's scale, etc., divided according to the sines, or expressing the sines. Natural sines, sines expressed by natural numbers. Versed sine of an arc or angle, the segment of the diameter intercepted between the sine and the extremity of the arc.

Sin Eaters, a class of men formerly employed in Wales and on the Welsh border, in connection with funeral rites, to eat a piece of bread and drink a cup of ale placed on the bier, and so symbolically take on themselves the sins of the deceased. As soon as this was done the sin eater "pronounced the ease and rest of the soul departed, for which he would pawn his own soul," and so took his way, having freed the dead sinner from the necessity of walking an unquiet ghost. The name may be due to a mistaken interpretation of Hosea, iv: 8—"They eat up the sin of my people"; but the real origin of this strange custom must undoubtedly be found in the Levitical scape goat (Levit. xvi: 21–22). Aubrey is the chief authority for this usage, and describes it as once common in Shropshire, Herefordshire, and North Wales. It seems also to have been practised in Galloway.

Sinecure, in common language, an office which has revenue without employment. In the English canon law a sinecure is an ecclesiastical benefice, such as a chaplainry, canonry, or chantry, to which no cure of souls is attached, and where residence is not required. The strictest kind of sinecure is where the benefice is a donative, and is conferred by the patron expressly without cure of souls, the cure either not existing or being committed to a vicar. Sinecure rectories were abolished in 1840. Sinecure offices were formerly very numerous in the English public service. They were used to enrich ministers of State and their families; Sir R. Walpole, for example, presented his son Horace to three or four sinecure places which brought him in a large income. The number of such places has been greatly diminished by modern reforms; the stewardship of the Chiltern Hundreds and some other offices of merely nominal profit are retained, because by accepting one of them a member of the House of Commons is enabled to vacate his seat.

Si-ngan-foo, the capital of the province of Shen-si, in Northwest China. It was long the capital of the empire, and is still of stragetic and commercial importance (see SHEN-SI). Silk, tea, and sugar are the principal articles of commerce. Pop. estimated at about 1,000,000.

Singapore, a British dependency in Asia, the most important of the Straits Settlements; consisting of the island of Singapore (27 miles long, 14 broad; area, 206 square miles), separated from the S. extremity of the Malay Peninsula by a strait only half a mile wide at its narrowest, and of a great number of very small islands along its shores. The surface is undulating, the highest point reaching 520 feet only. The climate is hot and moist, but the soil is not particularly fertile; nevertheless the island is perpetually clothed with verdure, and yields good crops of coffee, pineapples, cocoanuts, aloes, and every kind of fruit, especially East Indian fruit (*e. g.*, mangosteen and durian). Gambier, pepper, and nutmegs used formerly to be the staple crops; but all three are cultivated to a much smaller extent than formerly. This island was purchased in 1824 from the Sultan of Johore for $62,500, and a life rent of $25,000. Pop. of island (1901) 228,555.

Singapore, the capital of the dependency of the same name, is the only town on the island. It occupies a pleasant site on the S. E. coast, on the Strait of Singapore, the principal waterway for vessels trading between Eastern Asia and India and Europe. This city was founded by Sir Stamford Raffles in 1819 as an emporium for British trade in the East Indies, and it has since that time advanced and grown in prosperity till it has become the most important trading-place in the S. E. of Asia, its only competitor being Batavia in Java, from which it is 600 miles distant. Singapore is a picturesque, well-built town, with fine public buildings and all kinds of appliances in the nature of public works. It possesses a governor's residence, St. Andrew's Protestant cathedral (1861–1870), a Roman Catholic cathedral, Mohammedan mosques, Hindu temples, Chinese joss-houses, Raffles museum (1823), the supreme law-courts, postoffice (1883), hospitals, jail, barracks, and fine botanical and zoölogical gardens. It is defended by numerous batteries and forts, and is a naval coaling station and depot. The docks, stores, and dwelling houses extend for 6 miles or more along the sea front. The harbor is spacious and safe and remarkably easy of access, and its dock accommodation embraces two graving docks, an admiralty dock, and several docks of the ordinary kind. The total annual trade of Singapore has increased at a remarkable rate since the city was founded. The imports exceed the exports to the extent of one-fourth. The imports embrace nearly every kind of European manufacture, while the exports consist of the productions of the East Indies, China, Japan, and the islands of the Western Pacific. The tonnage of the vessels entering the port has been known to increase at the rate of 74 per cent. annually. The vessels of the P. and O. Company, the Messageries Maritimes, and other large companies trading to China, Australia, and the East put in regularly at Singapore. The population has grown at the same rapid rate as the commerce: in 1824 the town had 10,603 inhabitants; in 1900, 193,089. This number included about 90,000 Chinese, 25,000 Malays, 12,000 natives of India, and 1,300 Europeans. There is a vast disproportion between the numbers of the male (105,423) and the female (33,785) inhabitants. The death rate is high, yet the climate, in spite of Singapore being situated little more than 1° N. of the equator, is uniform and agreeable, the nights being particularly cool and refreshing. The thermometer ranges between 67° and 94° F. and has a mean of about 82°. The rainfall varies from 65.6 to 92.2 inches in the year. There was a former town on the site of the present city, which was founded by Malay converts to Hinduism from Java or Sumatra, apparently in the 12th century; but it had wholly disappeared when Sir S. Raffles laid the foundations of the existing Singapore (*i. e.*, "Lion City"). It was made the capital of the STRAITS SETTLEMENTS (*q. v.*) in 1830, superseding Penang.

Singbhum, a non-regulation district of the province of Chota Nagpur, Bengal, British India, lying among the hills W. of Midnapore; area, 3,897 square miles. It contains several semi-independent States; and the tract known as the Kolhan, where the fighting Hos or Larka Kols, an aboriginal tribe who have often given much trouble, are now most peaceably settled. The products are rice, grown upon artificial terraces in the valleys; tussur silk, lac, and beeswax; iron, limestone, and soapstone. Copper also was formerly mined. The chief town is Chainbasa, where a large annual fair is held. The inhabitants are almost all hill tribes, among whom the Christian missions are most successful.

Singhala. See CEYLON.

Singhara Nuts, the large edible seeds of *Trapa bicornis,* a native of China, and *T. bispinosa* and *T. natans,* natives of India. The nuts abound in fecula. In China the kernels are roasted or boiled, like potatoes. Called also water nuts.

Singing, the production of music by the human voice. The principal requisites in singing are a good voice, a correct ear, and a sound rudimentary knowledge of music. By careful practice, purity of tone and flexibility of execution may be attained, and the sweetness, brilliancy, and compass of the voice increased in a marked degree. Good singing is dependent as much on training as on natural gifts, as a vocalist who

sings correctly and with taste will often afford more pleasure than another who has much greater compass and power of voice, but lacks cultivation.

There are three kinds of female voices — soprano, mezzo-soprano, and contralto; and three of male voices — bass, baritone, and tenor. A higher and uncommon class of male voices is known in England as alto or counter-tenor. The range and compass of voices among singers of all kinds are extremely variable, and it is not the compass alone, but the quality of notes in portions of the compass which determines the class under which a voice should be placed. In voices there are, numerically speaking, three qualities or registers — the chest voice (*voce di tetto*), the middle voice and the head voice (*voce di testa*). The chief distinction is, however, between the natural voice and the falsetto voice. To produce the notes of the former, the impulse should be made wholly from the chest, while the notes of the falsetto are given by directing the voice to the head. An accomplished singer is able to link the notes in the different registers without apparent effort, so as to completely disguise the effect of the break.

The best position in singing is standing. The singer should be at his ease, with his heal erect and his chest well forward. The mouth should be sufficiently open to give a distinct pronunciation and a round quality of tone. The breath should be taken as silently as possible and at judicious intervals, such as at the end of phrases or sections, after rests or staccatoed notes, and before long notes and cadences. To become a correct reader at sight it is necessary to be able to take all musical intervals with readiness and precision.

In exercising the voice the best method is to sing the notes of the diatonic and chromatic scales slowly, commencing and ending each note softly with a swell in the middle to the full power of the voice. This is known as the *Messa di Voce.* The graces of singing, such as turns, shakes, and cadenzas, can only be accomplished with facility after assiduous practice. Expression depends on the power of modifying the voice through the gradations of *piano* and *forte,* and a correct application of accent, emphasis, etc. As a rule, ascending passages are sung with a gradual increase of tone, and descending scales with a corresponding diminution; syncopated and tied notes require extra emphasis; slow movements are elegantly and softly sung, and rapid movements with spirit and brilliancy. Where a phrase or a note is repeated, a variety of expression should be introduced. Above all, the singer should feel what he sings, and his voice should faithfully express the emotions depicted in the words. Only thus will the language of his song touch the hearts of his hearers. The *Vibrato,* or vibration of the voice, when judiciously applied, is often effective and pleasing, but its continual and indiscriminating use is a grave fault. Bass and baritone parts are written in the F clef, the others usually in the C clef.

Singing Flame, in physics, a flame, either naked or enclosed in a tube, which emits musical sounds under certain conditions.

Single Combat. See COMBAT, SINGLE.

Single Standard, a phrase used in the discussion of BIMETALLISM (*q. v.*), to indicate a single standard of value; that is gold alone or silver alone. Double standard means the concurrent use of both metals as standards.

Single Tax, the principle held by HENRY GEORGE (*q. v.*) and his followers, that the value which the growth and improvement of the community attaches to land should be taken for the use of the community, so that no tax need be levied on the product of labor, but all public revenues for national, state, county, and municipal purposes could be raised by a single tax on land values, irrespective of improvement. The originator urged the adoption of his theory on two grounds, "governmental expediency" and "social justice."

Mr. George stated his theories in "Progress and Poverty," a book that appeared in 1879. In it he infers that there must be a common cause for the misery of poverty, seeing that

> "there is distress where large standing armies are maintained, but that there is also distress where the standing armies are nominal; there is distress where protective tariffs stupidly and wastefully hamper trade, but there is also distress where trade is nearly free; there is distress where autocratic government yet prevails, but there is also distress where political power is wholly in the hands of the people; in countries where paper is money, and in countries where gold and silver are the only currency."

Commenting on these findings, he says:

> "There is but one way to remove an evil, and that is to remove its cause. Poverty deepens as wealth increases, and wages are forced down while productive power grows, because land, which is the source of all wealth and the field of all labor, is monopolized. To extirpate poverty, to make wages what justice commands, the full earnings of the laborer, we must therefore substitute for the individual ownership of land a common ownership. Nothing else will go to the cause of the evil — in nothing else is there the slightest hope. This, then, is the remedy for the unjust and unequal distribution of wealth apparent in modern civilization, and for all the evils which flow from it."

The advantages claimed for the single tax system were stated in full in the platform adopted by the National Conference of the Single-Tax League of the United States at Cooper Union, New York, Sept. 3, 1890. Mr. George was chairman of the Committee

on Platform, and prepared the declaration which follows:

We assert as our fundamental principle the self-evident truth enunciated in the Declaration of American Independence, that all men are created equal and are endowed by their Creator with certain inalienable rights.

We hold that all men are equally entitled to the use and enjoyment of what God has created and of what is gained by the general growth and improvement of the community of which they are a part. Therefore, no one should be permitted to hold natural opportunities without a fair return to all for any special privilege thus accorded to him, and that value which the growth and improvement of the community attach to land should be taken for the use of the community.

We hold that each man is entitled to all that his labor produces. Therefore no tax should be levied on the products of labor.

To carry out these principles we are in favor of raising all public revenues for national, State, county, and municipal purposes by a single tax on land values, irrespective of improvements, and of the abolition of all forms of direct and indirect taxation.

Since in all our States we now levy some tax on the value of land, the single tax can be instituted by the simple and easy way of abolishing, one after another, all other taxes now levied, and commensurately increasing the tax on land values, till we draw on that one source for all expenses of government, the revenue being divided between local governments, State governments, and the general government, as the revenue from direct taxes is now divided between the local and State governments; or, a direct assessment being made by the general government upon the States and paid by them from revenues collected in this manner.

The single tax we propose is not a tax on land, and therefore would not fall on the use of land and become a tax on labor.

It is a tax, not on land, but on the value of land. Thus it would not fall on all land, but only on valuable land, and on that not in proportion to the use made of it, but in proportion to its value — the premium which the user of the land must pay to the owner, either in purchase money or rent, for permission to use valuable land. It would thus be a tax not on the use or improvement of land, but on the ownership of land, taking what would overwise go to the owner as owner, and not as user.

In assessments under the single tax all values created by individual use or improvement would be excluded, and the only value taken into consideration would be the value attaching to the bare land by reason of neighborhood, etc., to be determined by impartial periodical assessments. Thus the farmer would have no more taxes to pay than the speculator who held a similar piece of land idle, and the man who on a city lot erected a valuable building would be taxed no more than the man who held a similar lot vacant.

The single tax, in short, would call on men to contribute to the public revenues, not in proportion to what they produce or accumulate, but in proportion to the value of the natural opportunities they hold. It would compel them to pay just as much for holding land idle as for putting it to its fullest use.

The single tax, therefore, would:

(1) Take the weight of taxation off the agricultural districts where land has little or no value irrespective of improvements, and put it on towns and cities, where bare land rises to a value of millions of dollars per acre.

(2) Dispense with a multiplicity of taxes and a horde of tax gatherers, simplify government and greatly reduce its cost.

(3) Do away with the fraud, corruption, and gross inequality inseparable from our present methods of taxation, which allow the rich to escape while they grind the poor. Land cannot be hid or carried off, and its value can be ascertained with greater ease and certainty than any other.

(4) Give us with all the world as perfect freedom of trade as now exists between the States of our Union, thus enabling our people to share, through free exchanges in all the advantages which nature has given to other countries, or which the peculiar skill of other peoples has enabled them to attain. It would destroy the trusts, monopolies, and corporations which are the outgrowths of the tariff. It would do away with the fines and penalties now levied on any one who improves a farm, erects a house, builds a machine, or in any way adds to the general stock of wealth. It would leave every one free to apply labor or expend capital in production or exchange without fine or restriction, and would leave to each the full product of his exertion.

(5) It would, on the other hand, by taking for public use that value which attaches to land by reason of the growth and improvement of the community, make the holding of land unprofitable to the mere owner, and profitable only to the user. It would thus make it impossible for speculators and monopolists to hold natural opportunities unused or only half used, and would throw open to labor the illimitable field of employment which the earth offers to man. It would thus solve the labor problem, do away with involuntary poverty, raise wages in all occupations to the full earnings of labor, make overproduction impossible till all human wants are satisfied, render labor-saving inventions a blessing to all, and cause such an enormous production and such an equitable distribution of wealth as would give to all comfort, leisure, and participation in the advantages of an advancing civilization.

With respect to monopolies other than the monopoly of land, we hold that where free competition becomes impossible, as in telegraphs, railroads, water and gas supplies, etc., such business becomes a proper social function, which should be controlled and managed by and for the whole people concerned, through their proper government, local, State, or national, as may be.

Sing Sing. See OSSINING.

Singultus, in medicine, a noise made by the sudden and involuntary contraction of the diaphragm, and the simultaneous contraction of the glottis, which arrest the air in the trachea. It is the symptom of many morbid conditions, and especially of gangrene, but occurs frequently in persons otherwise in good health.

Sinical Quadrant, a quadrant formerly used for taking the altitude of the sun. It had lines drawn from each side intersecting each other, with an index divided by sines, also with 90° on the limb, and sights at the edge.

Sinigaglia, or **Senigallia,** a seaport on the Adriatic coast of Italy; 16 miles N. W. of Ancona; was down to 1869 celebrated for its annual fair, July 20 to Aug. 8. It was founded by the Senonian Gauls, and colonized by the Romans 289 B. C. There are here a cathedral (1787) and a palace of the dukes of Urbino. Pius IX. was born here.

Sinister, in heraldry, a term which denotes the left side of the escutcheon.

Sinking Fund, a fund set aside, from various sources of revenue, by a government, State, or company, for the gradual extinction or amortization of its debt.

Sinking Fund, First National. Everything was done by the 1st Congress of the

United States that could be to raise and sustain the public credit. For this purpose a sinking fund for the reduction of the public debt was provided for. The Funding Act required the interest on the public debt to be converted into capital. This left a considerable unappropriated sum to accumulate in the national treasury. Congress provided that all the surplus in the treasury on the last day of December (1790), after payment of the appropriations of the current session, should be applied to the reduction of the public debt. This sum, with $2,000,000 more which the President was authorized to borrow, was made to constitute a fund to be employed under the management of a board composed of the Chief-Justice, the president of the Senate, the Secretary of the Treasury, and the Attorney-General, in the purchase of the securities of the United States at their market value, if not above par. The securities so purchased were to be vested in the board, and the interest thereon, by the provisions of a subsequent act, was to be applied to the purchase of further securities, with a reserve, however, toward the discharge of the borrowed $2,000,000, principal and interest. This measure was intended to raise the stock market so as to prevent the transfer of securities to Europe at depreciated rates.

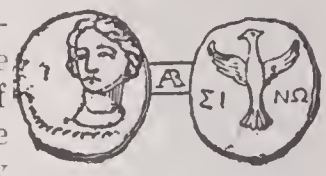
Sinnett, Alfred Percy, an English journalist; born in London in 1840. He was on the staff of the London "Globe" in 1859; afterward edited the "Daily Press" at Hong Kong. In 1871 he was editor of the "Pioneer," at Allahabad, India. Returning to England in 1882, he published "The Occult World" and "Esoteric Buddhism" (1883), which immediately connected his name with the Theosophical movement and with its originator Madame Blavatsky.

Sin Offering, in Judaism, the Hebrew *chhattath*, a sacrifice for the removal of sin, first instituted in Lev. iv. When a sin had been committed by an anointed priest, a young bullock without blemish was brought to the door of the tabernacle of the congregation before the Lord. The priest laid his hand on the bullock's head (as if to transfer his sins to the animal), and then killed it before the Lord. He next sprinkled its blood seven times before the veil of the sanctuary, put some of it on the horns of the altar of incense, burnt the fat, etc., and then the bullock itself outside the camp (Lev. iv: 1–12). There were similar ceremonies in the case of the people at large (13–21), or of a ruler (22–26), or one of the common people (27–35). Sometimes a ram or a kid of the goats was substituted for a bullock, or, in case of poverty, a turtle-dove (v: 7); or, if the indigence was still greater, the 10th part of an ephah of fine flour (11). There were stated times or occasions on which sin offerings were sacrificed (Num. xxviii: 15; xxix: 38). The Christian sees in the sin offering a vivid type of the propitiatory sacrifice of Christ. (Heb. vii: 27; ix: 13, 14; x: 26, etc).

Sinologue, a student of the Chinese language, literature, history, etc.; one who is versed in Chinese language and literature.

Sinon, the Greek who, according to the legend, threw himself into the hands of the Trojans and persuaded them to admit the wooden horse.

Sinope (Turkish, Sinub), a town of Asiatic Turkey; on a rocky tongue projecting into the Black Sea; 220 miles W. by N. of Trebizond. It has two harbors, one presenting the finest anchorage along the N. coast of Asiatic Turkey. The town is surrounded by ancient Byzantine walls, and has a ruined castle built under Byzantine influence. The bay was the scene of a naval engagement on Nov. 30, 1853, when a Turkish squadron was destroyed by the Russian fleet. The ancient city of Sinope was founded by a colony of Milesian Greeks, and for several years shared with Byzantium the supremacy of the Euxine. It was made by Pharnaces the capital of the kingdom of Pontus in 183 B. C. The great Mithridates, who was born within its walls, raised it to a lofty pitch of splendor. But in 72 B. C. it capitulated to Lucullus, and in 45 B. C. was made a Roman colony. After belonging successively to the empire of Trebizond (from 1204) and the Seljuks, it was conquered by the Turks in 1461. Sinope was the birthplace of Diogenes the cynic. Pop. 8,000.



COIN OF SINOPE.

Sinople, red ferruginous quartz, of a blood or brownish red color, sometimes with a tinge of yellow. It occurs in small very perfect crystals, and in masses resembling some varieties of jasper.

Sinter, the name given by German mineralogists to those rocks which are precipitated in a crystalline form from mineral waters. Sinter is of various forms, kidney-shaped, knotted, tuberous, botryoidal, tubular, stalactitic, shrub-like, or pronged, and is occasionally distinguished by its chief component, as calc sinter, siliceous sinter, iron sinter, etc. Calc sinter, which is a variety of carbonate of lime, composed of concentric plane parallel layers, appears under various forms; it is deposited with extraordinary rapidity by many springs, a peculiarity frequently made use of to obtain the incrustation of objects with a coating of this substance. Siliceous sinter is mostly found in intermittent hot springs, as in

the geysers of Iceland. Iron sinter occurs in old mines and in coal-beds, where it is formed from iron pyrites through the agency of the atmosphere. The tubular conglomeration of grains of sand half-melted by lightning (*blitz*) is also known as blitz sinter, or fulgurite.

Sinus, in anatomy, a term for the air cavities contained in the interior of certain bones — as the frontal, ethmoid, sphenoid, temporal, and superior maxillary. The frontal sinuses are two irregular cavities extending upward and outward from their openings on each side of the nasal spine, between the inner and outer tables of the skull, and separated from one another by a thin bony septum. They give rise to the prominences above the root of the nose called the superciliary ridges. They are not fully developed till after puberty, and vary considerably in size, being usually larger in men than in women and young persons. When very much developed they give a receding appearance to the forehead. They are larger in Europeans than in Negroes, and are very imperfectly developed in the Australians, whose peculiar want of vocal resonance is apparently due to this deficiency. They communicate on each side of the upper part of the nostril by a funnel shaped opening, which transmits a prolongation of mucous membrane to line their interior. These sinuses are much more highly developed in certain mammals and birds than in man. Sir Richard Owen observes that "they extend backward over the top of the skull in the ruminant and some other quadrupeds, and penetrate the cores of the horns in oxen, sheep, and a few antelopes. The most remarkable development of air sinuses in the mammalian class is presented by the elephant; the intellectual physiognomy of this huge quadruped being caused, as in the owl, not by the actual capacity of the brain case, but by the enormous extent of the pneumatic cellular structure between the outer and inner plates of the skull." The sphenoidal sinuses are two large irregular cavities, formed, after the period of childhood, in the body of the sphenoid bone. They communicate with the upper part of the nose, from which they receive a layer of mucous membrane. Like the frontal sinuses, they serve to lessen the weight of the skull and to add to the resonance of the voice. The ethmoid sinuses lie in the lateral masses of the ethmoid bone. They communicate with the cavities of the nose. Their main use is to diminish the weight of the forepart of the skull. That part of the temporal bone which forms the projection behind the ear is termed the mastoid process. The interior of this process is hollowed out with air sinuses which communicate with the tympanum or middle ear, and through it with the nose. The superior maxillary sinus is the largest of the sinuses, and the only one present in the infantile skull. The term sinus is also applied to certain channels for the transmission of venous blood.

Sion. See ZION.

Siout, or **Asioot,** the chief city of Upper Egypt; near the W. bank of the Nile, about 200 miles S. of Cairo. It has some fine mosques, an imposing government palace, an American mission school, and well-built dwelling houses. The people, about 32,000 in number, make black and red earthenware, and fans of ostrich feathers, and carve ivory. There is some trade (annual value $1,900,000) with Darfur and Senaar. Siout is built on the site of the ancient Lycopolis; but few remains of the Græco-Egyptian city are extant. From the neighboring heights of the Libyan mountains, which contain numerous rock sepulchers, the view over the valley of the Nile is perhaps the finest in Egypt.

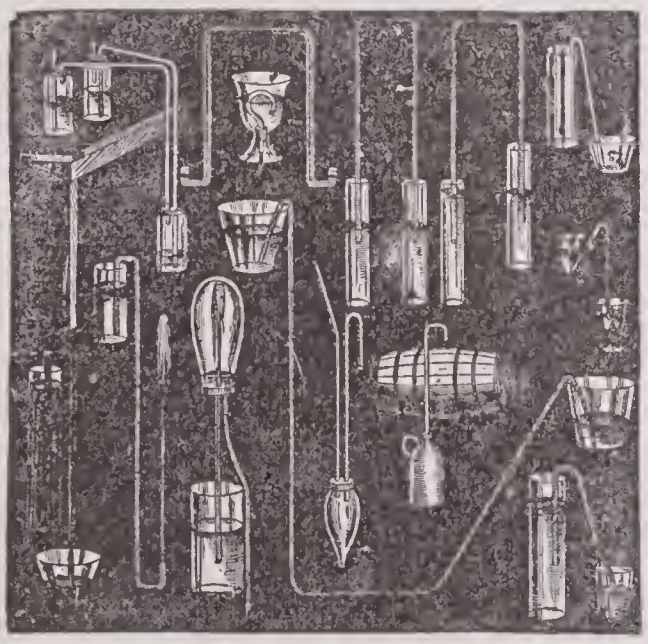
Sioux City, a city and county-seat of Woodbury co., Ia.; on the Missouri river, and on the Union Pacific, the Sioux City, O'Neill and Western, the Sioux City and Pacific, the Sioux City and Northern, the Chicago, Milwaukee, and St. Paul, the Chicago, St. Paul, Minneapolis, and Omaha, and the Illinois Central railroads; 100 miles N. of Omaha. Here are Morningside College, a high school, college of medicine, a city normal school, college of music, Women's Home for the Friendless, Babies' Home, Boys' and Girls' Home, St. Joseph and Samaritan Hospitals, United States government building, public library, waterworks, street railroad and electric light plants, several National and private banks, and numerous daily and weekly periodicals. The United States census for 1900 reported for Sioux City 329 manufacturing establishments, employing $5,691,644 capital and 3,104 persons, paying $1,485,066 for wages and $10,489,555 for materials, and having a combined output valued at $15,469,702. Sioux City has one of the largest linseed oil plants in the country. It also contains large slaughtering and meat-packing plants, and the general shops of several railroads. The assessed property valuation is nearly $6,000,000. Pop. (1890) 37,806; (1900) 33,111; (1910) 47,828.

Sioux Falls, a city and county-seat of Minnehaha co., S. D.; on the Sioux river, and on the Illinois Central, the Great Northern, the Chicago, St. Paul, Minneapolis, and Omaha, the Burlington, the Cedar Rapids and Northern, and the Chicago, Milwaukee, and St. Paul railroads; 90 miles N. of Sioux City, Ia. It contains the Sioux Falls University (Bapt.), the State penitentiary, the State School for Deaf Mutes, libraries, several National and other banks,

and several daily and weekly newspapers. The city is the seat of a Roman Catholic bishop, and of the Protestant Episcopal bishop of South Dakota. It has important jasper quarries, and manufactories of woolen and linen goods, etc., and an assessed property valuation of about $2,500,000. Pop. (1900) 10,266; (1910) 14,094.

Sioux, or **Dakota, Indians,** a once powerful family of North American Indians. Their number is estimated at 25,000; they are well advanced in civilization and are increasing in population. In 1862, the Sioux under the lead of Little Crow, a noted chief, in consequence of the annuity not having been paid to their satisfaction, waged a most cruel and exterminating war on the whites of Minnesota; and so well concerted were their schemes that no less than 640 men, women, and children, and 94 soldiers, were killed before the massacre was stayed. As an atonement for their great crime in thus murdering the whites, the Federal government allowed only 38 out of 303 Indians found guilty by a proper tribunal, to be executed. This clemency, though seemingly unjust, was the result of mature deliberation on the part of the authorities at Washington, who found that the Indians had been greatly wronged by some of the whites, not only in withholding their annuities, but in extorting money from them for the most trivial consideration, and in consequence of which the Indians sought revenge. They are now divided into small branches, and located on several reservations, chiefly in North and South Dakota and Minnesota.

Siphon, a curved tube having one branch longer than the other; used for transferring liquids from higher to lower levels. It acts



VARIOUS FORMS OF SIPHONS.

by atmospheric pressure, and consequently cannot be depended on for overcoming heights greater than about 30 feet near the level of the sea, and a less height at greater elevations. It is used in transferring liquids in the following manner: The siphon is filled with some liquid, and the two ends being closed, the shorter leg is dipped in the liquid, or the shorter leg having been dipped in the liquid, the air is exhausted by applying the mouth at the extremity of the longer leg. A vacuum is thus produced, the liquid in the vessel rises and fills the tube in consequence of the atmospheric pressure. It will then run out through the siphon as long as the shorter end dips in the liquid.

In zoölogy, a canal, often drawn out into a long tube, through which water passes to the respiratory chamber in various conchiferous mollusks, especially those which burrow in the sand. Though the combined siphons of Mya are much longer than the shell, and those of some Tellinidæ three or four times as long, they may be retracted within the shell. There is also a tubular prolongation or folding of the mantle, constituting a siphon to convey water to and from the breathing apparatus of some gasteropods.

Siphon Bottle, a flask for containing aërated waters, which may be discharged without uncorking through a bent tube provided with a downwardly opening valve operated by a lever, and kept to its seat by pressure of the contained gas, which, when the valve is displaced by pressure on the lever, forces out the liquid till all is discharged, as is seen in the common seltzer-water bottle.

Siphon Cup, in machinery, a form of lubricator in which the oil is led over the edge of the vessel by capillary action, ascending and descending in a cotton wick and dropping on the journal.

Siphon Gauge, a bent glass tube partially filled with mercury, used for ascertaining the degree of exhaustion effected by an air pump, and also for ascertaining the degree of vacuum in the condenser of a steam engine, or for indicating the pressure of a fluid contained in a vessel when greater than the pressure of the external atmosphere, and also the pressure of liquids, as of water in pipes, etc.

Siphonia, a genus of plants, order *Euphorbiaceæ.* They are trees containing a milky juice in more or less abundance, though all the species do not yield caoutchouc of good quality. One of them, *S. elastica,* is a native of French Guiana, and the remainder of the Amazon and Rio Negro districts of Brazil. They are called seringa trees by the Brazilians, from the Portuguese word *seringa,* signifying a syringe or clyster pipe, the caoutchouc having first been used for making those articles. The bulk of the caoutchouc at present ex-

ported from Pará is obtained from *S. Brasiliensis,* which is common in the forests of that province; but that brought down to Pará from the Upper Amazon and Rio Negro is derived from *S. lutea* and *S. brevifolia.* These three species are all slender, smooth-stemmed trees, averaging 100 feet in height; the Pará species, however, yields the greatest abundance of caoutchouc.

Siphonophora, in zoölogy, *Oceanic Hydrozoa;* an order or a sub-class of *Hydrozoa,* possessing a free and oceanic hydrosoma, consisting of several polypites, united by a flexible, contractile, unbranched or slightly branched cœnosarc, the proximal end of which is usually furnished with nectocalyces, and dilated into a somatocyst or into a pneumatophore. All are unattached, permanently free, and have the hydrosoma composite. They are beautiful organisms, usually found floating on the surface of tropical seas. *P. utriculus,* the Portuguese man-of-war, is the most familiar member of the group. The sub-class is divided into two orders: *Calycophoridæ* and *Physophoridæ;* and the order into four sub-orders: *Physophora, Physalia, Calycophora,* and *Discoida.*

Siphonostomata, in zoölogy, carnivorous gasteropods; a section of Prosobranchiata. Shell spiral, usually imperforate; aperture notched or produced into a canal in front; operculum horny, lamellar. Animal with retractile proboscis; eye-pedicels connected with the tentacles; margin of mantle prolonged into a siphon, by which the water is conveyed to the branchial chamber; gills one or two, pectinate, placed obliquely over the back. Families: *Strombidæ, Muricidæ, Buccinidæ, Conidæ, Volutidæ,* and *Cypræidæ;* all marine.

Sipunculus, in zoölogy, the type-genus of *Sipunculidæ.* The proboscis, which is retractile, is as long as the body, furnished with short tentacular appendages arranged in a circle round the mouth; intestine coiled and bent upon itself, so as to terminate in the middle of the body. *S. bernhardus* is common in European waters, living at a depth of 10 to 30 fathoms, occupying the shell of some univalve mollusk for the protection of its soft vermiform body, plastering up the entrance, leaving only a hole for the protrusion of its proboscis. Other species burrow in sand, as does *S. edulis,* eaten by the Chinese.

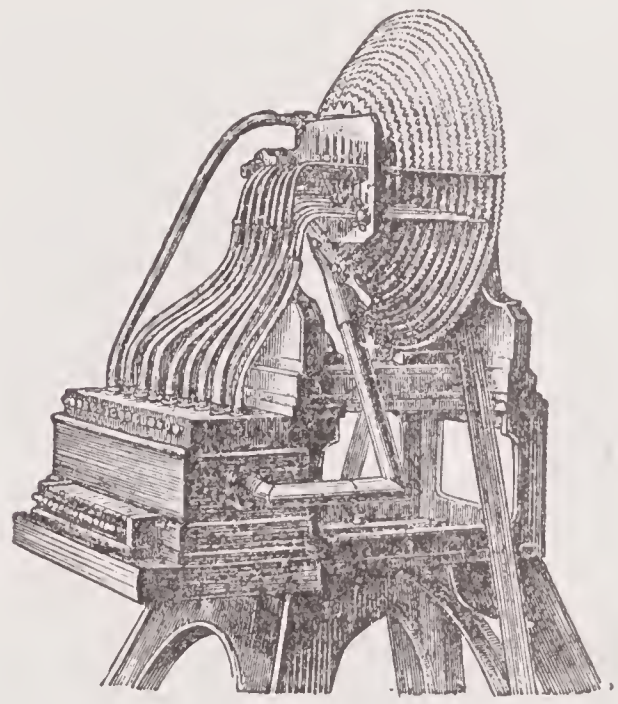
Sipylite, a tetragonal mineral, occurring in octahedrons; hardness, 6.0; sp. gr., 4.89; luster, resinous; color, brownish-black to brownish-orange. Composition: Essentially a columbate of erbium, lanthanum, didymium, serium, etc. Found in Amherst co., Va.

Siquis, an announcement made by a candidate for the ministry of his purpose to make inquiry as to whether his candidature may be challenged.

Sir, a term of complimentary address applied commonly, without regard to position or standing, to men of any degree; a general title by which a person addresses the man to whom he is speaking. Commonly used as a title of respect by sons to their fathers, pupils to their teachers, and generally by inferiors to superiors; also in phrases expressing doubt, displeasure, astonishment, or the like. Also, an English title of honor given to baronets and knights; it is always prefixed to the Christian name, as Sir John, Sir Robert, etc.

Sir-Daria, Jaxartes, or **Sihon,** a river in Central Asia, which rises in the W. slope of the Thian Shan Mountains, and flows through the Russian districts of Ferghana and Sir-Daria into the N. E. side of Lake Aral, after a tortuous course of about 1,200 miles. It is of little value for navigation.

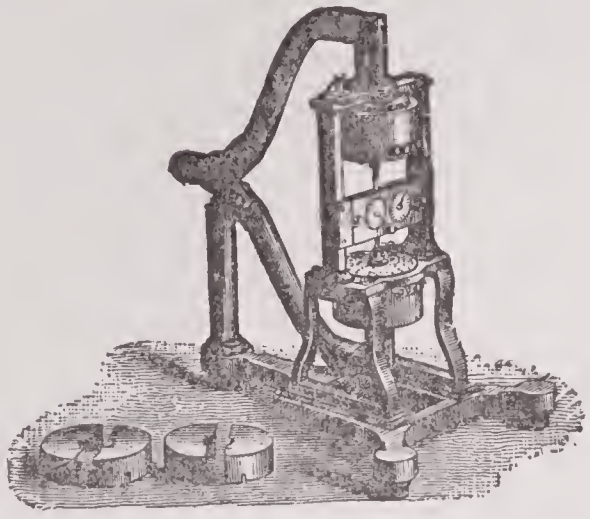
Siren, in acoustics, an instrument for determining the number of vibrations corresponding to a note of any given pitch.



TOOTHED SIREN.

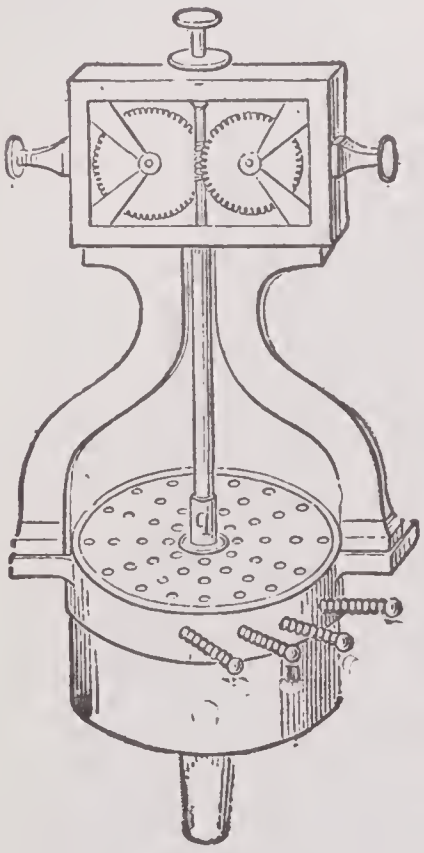
In its most elementary form the siren is simply a perforated rotating disk, against which a current of air is directed, producing sounds of higher or lower pitch according to the velocity of rotation. The improved siren of Helmholtz consists of two equal disks, one forming the top of a hollow fixed cylinder into which air can be driven, the other capable of revolving concentrically on it with the smallest possible amount of friction. A circle of small holes, equidistant from each other, is bored upon each disk and concentric with it, those in the upper disk being inclined slantwise to its plane, those in the lower being slantwise also, but in the opposite direction. There are arrangements for registering the number of

revolutions the upper disk performs in a minute. Thus, when air is forced into the cylinder, it will pass through the perforations, and, by reason of their obliquity, will



SIREN OF HELMHOLTZ.

cause the movable disk to revolve with a rapidity corresponding to the pressure, and each time that the holes coincide, a number of little puffs of air get through simultaneously, and, if the pressure of the air in the cylinder is sufficient, the series of impulses thus given will link themselves together, forming a continuous note. From the deep, piercing nature of the sound which the siren emits, it is well adapted for fog signals or alarms. In this case two disks rotating with great rapidity in opposite directions are employed. They are driven by a steam engine, which also forces a blast of steam through their apertures when those in the two disks come in apposition. The device is placed at the smaller extremity of a large trumpet, which intensifies the sound.



SIREN.

In classical mythology, certain melodious divinities who dwelt on the shores of Sicily and so charmed passing mariners by the sweetness of their song that they forgot their homes and remained there till they perished of hunger. According to one legend they threw themselves into the sea, from rage and despair, on hearing the more melodious song of Orpheus. Originally there were only two sirens; but their number was afterward increased to three, and their names are given with great variety.

In zoölogy, mud eels: a genus of *Urodela* or of *Perennibranchiatc Ichthyoidea*, constituting the family *Sirenidæ*. They are eel-like amphibians, with two anterior feet and permanent branchiæ, and range from Texas to Carolina. There are three species. *S. lacertina* is the mud eel.

Sirenia, an order of aquatic Mammalia, allied to the Cetacea, with which they were formerly and are still occasionally classed. The body is long, compact, and cylindrical, narrowing toward the tail, which is set horizontally and terminates either in forked flukes or a flat fibrous expansion. Hind limbs and sacrum absent; anterior limbs converted into paddles. Snout fleshy and well developed; nostrils on upper surface; lips fleshy, the upper lip usually with a moustache. The skin is rough and sparsely hairy, or smooth like that of the whale. The two mammæ are on the breast, close to the armpits, and there is little doubt that from the habit of the dugong raising the upper part of its body perpendicularly out of the water and clasping its young to its breast, the stories of sirens and mermaids took their rise. There are two recent genera, *Halicorc* and *Manatus*. The former is monophyodont, the latter diphyodont, the permanent teeth consisting of molars with flattened crowns adapted for bruising vegetable food. The recently extinct genus *Rhythina* had no true teeth. The sirenia pass their life in the water, living chiefly in shallow bays, estuaries, lagoons, and rivers, never straying far from shore, and feeding solely on aquatic vegetation.

Sirex, in entomology, the typical genus of *Uroceridæ*. It was formerly called *Urocerus*. *S. gigas* is the great-tailed wasp. It is, however, an abberrant sawfly, the apparent sting being a projecting ovipositor. It is black, the antennæ, the hinder part of the head on each side, the tibiæ and tarsi, and the base and apex of the abdomen yellow; abdomen of the male reddish, spotted with black at the sides and apex. It is not uncommon in pine and fir woods. The eggs are deposited about an inch from the surface, and the hatched grubs bore deeper. The male is banded with orange, while the female is dark purple.

Sirhind, a tract of land intervening between the Jumna and Sutlej rivers, Punjab, India. The whole tract has hitherto been unfertile from want of irrigation, but the Sirhind canal, 542 miles long, will remedy this defect.

Sirikul, a lake on the Pamir plateau, in Central Asia; 15,000 feet above the sea. It is about 14 miles long by 1 mile broad,

and is the source of the chief branches of the Amu Daria or Oxus.

Sirius, in astronomy, the dog star, by far the brightest fixed star in the sky. It is *alpha Canis Majoris*, situated a little below Orion, and is mythologically regarded as one of the hounds held in leash by Orion, Procyon in *Canis Minor* being the other. A line drawn from the Pleiades through the three stars of Orion's belt will pass it closely; straight lines connecting it with Procyon and Betelguese will constitute a nearly equilateral triangle; and Aldebaran, Betelguese, Sirius, and Regel, all of the first magnitude, form a lozenge-shaped figure, with Orion's belt in the center. Ptolemy, in the 2d century, ranked Sirius among red stars; now it is white, and is a very brilliant object, its light being 324 times as great as that of a star of the sixth magnitude. It is about 1,000,000 times as far from us as the sun, and its mass is about 20 times as great. Viewed by the spectroscope, its chief lines are those of incandescent hydrogen, with feebler ones of sodium and magnesium; the metal mercury seems also to be present. Some irregular movements of Sirius led to the belief that a heavenly body existed near enough to produce a perturbation, and a son of Alvan Clark, of Boston (Mass.), discovered, on Jan. 31, 1862, what appears to be a planet revolving around Sirius as its sun, it is thought in about 49 years. The heliacal rising of Sirius varies in different latitudes, and the precession of the equinoxes makes it do so also in successive ages. When the heliacal rising of Sirius (called by the old Egyptians Sothes) took place, it indicated to them that the overflow of the Nile was at hand. Some consider the dog star to have been Procyon; but that hound rises, like the other dogs, far behind the "dog-days," in place of ushering them in.

Sirsa, the chief town of the district of the same name in the Punjab, British India; 149 miles N. W. of Delhi. The modern town was founded in 1837, near a ruined site. There is some trade in grain, sugar, and salt. The district of the same name, which is bounded W. by the Sutlej and traversed by the Ghuggur, has an area of 3,121 square miles. It is much overgrown by jungle. The breed of cattle is famous; at the fair at Sirsa town more than 150,000 are sold annually.

Sirocco, a hot wind storm. Most of the hot winds of the Old World are modified forms of the simoon. The sirocco originates in the Sahara and travels N. to the Mediterranean and Southern Europe, but it is not so deadly as the prototype. It brings with it great quantities of the desert sand, and the air becomes so dense at times that the sun is obscured as if by fog. While it remains on the African mainland it is characterized by a very marked dryness, as there are no extensive water surfaces to supply it with moisture. As soon, however, as it is launched over the Mediterranean it begins to take up copious draughts, so that when it reaches Malta, Sicily, and the S. shores of Europe as a wind from between S. E. and S. W., it has undergone a change from a hot, dry wind to a hot, damp wind. The result of this alteration is that it becomes most enervating to the human constitution. Indeed, while it prevails, from one to several days at a time, life is scarcely worth living, so depressing and burdensome is the wind. Human energy is quite dissipated under its fatiguing influence, and with a temperature ranging between 95° and 110° the streets of the towns affected by it are deserted. During its prevalence iron rusts, clothes spoil with mildew, meat turns putrid, grapes and green leaves wither, wine will not fine, and paint will not dry. Sicily experiences the sirocco about a dozen times a year, but it is not so frequently met with in other parts of Europe.

SISKIN.

Sirvente, or **Sirvante,** in mediæval literature, a species of poem in common use among the Troubadours and Trouveres, usually satirical, though sometimes devoted to love or praises, and divided into strophes of a peculiar construction.

Sisal, or **Grass Hemp,** a species of agave yielding a valuable fiber, a native of Mexico, Honduras, Central America, and specially cultivated in Yucatan. It is grown on stony ground, and the leaves, from which the fiber is prepared, are from two to three feet long. The pulp is cleaned away from each side of the leaf and the remaining fiber is then washed and sun-dried. It has considerable commercial value in the manufacture of cordage and coarse cloth.

Siskin, in ornithology, the *Carduelis spinus*, an autumnal visitant from the N. to temperate regions, generally leaving in the spring, though many pairs remain and

breed. The adult male is rather less than five inches long. Its plumage is chiefly green, spread over the back and upper parts of the body, with the center of each feather dark olive-green; top of head and chin black; patches of yellow behind the ear, on neck, breast, greater coverts and tail, and edge of quill feathers; abdomen and under-tail coverts white, deepening into gray on flanks. They nest usually in the fork of a bough, and lay from three to five eggs, bluish-white, spotted at the larger end with brown or gray. Breeders often pair the siskin with the Canary to obtain a song bird whose note is less shrill than that of the pure Canary. The name is also applied to the American pine-finch, and to several other related species in Asia and South America.

Sismondi, Jean Charles Léonard Simon de, a Swiss historian; born in Geneva, Switzerland, May 9, 1773. His principal works are: "History of the Italian Republics in the Middle Ages" (16 vols. 1807–1818); "History of the New Birth of Liberty in Italy" (1832); "History of the French" (31 vols. 1821–1834); "History of the Fall of the Roman Empire" (1835); "Julia Severa; or, The Year 492" (1822); "Literature of the South of Europe" (1813). He died in Geneva, June 25, 1842.

Sison, in botany, a genus of *Amminidæ* (Lindley); umbelliferous plants, section *Ammineæ* (Sir J. Hooker). Involuere of few leaves, partial, subdimidiate; calyx-teeth obsolete; petals broadly obcordate, deeply curved and notched, with an inflected point; carpels with five ribs and single elavate vitæ between them. Only known species *S. amomum,* the bastard stone parsley. It is a plant two or three feet high, the lower leaves pinnate, the upper cut into narrow segments.

Sisor, in ichthyology, a genus of *Siluridæ Proteropodes,* group Hypostomatina; having head depressed, spatulate; trunk depressed; tail long and thin; eyes very small; mouth inferior, small traverse, with barbels; no teeth. One species, *S. rhadophorus* from the rivers of Northern Bengal.

Sist, in Scotch law, the act of legally delaying diligence or execution on decrees for civil debts. A sist on a suspension is in the Courts of Session the order or injunction of the lord-ordinary prohibiting diligenee to proceed, where relevant grounds of supersession have been stated in the bill of supersession.

Sistan, an extensive level and low-lying tract on the borders of Persia and Afghanistan, partly filled by the Hamun (Sistan) Lake or swamp. It is divided between Persia and Afghanistan.

Sisterhoods, societies or communities of women living together under a religious rule, binding upon all, and with a common object for their united life. But in common use the word denotes those communities which are not enclosed, and whose life is one of active labor. An account of the great religious communities of women in the early and Middle Ages of Christianity falls under the head of Monachism. Indeed the state of Christendom for many centuries prevented the possibility of life and work for women such as that of Sisters of Charity. Women were affiliated to the great monastic orders, the Benedictine, Augustine, Carmelite, etc., but, with one partial exception, that of the Hospitallers, "Réligieuse Hospitalières," were invariably cloistered. There were several communities of hospital nuns, the great hospitals of the Hôtel Dieu at Paris, San Spirito at Rome, Dijon Hospital, and several others in France being served by them. But they lived in convents adjoining the hospitals, and only left their cloisters to nurse the sick. Even when the Franciscan and Dominican orders of preaching friars arose, the nuns belonging to them, the Poor Clares and Dominican nuns, were strictly enclosed.

It was the glory of St. Vincent de Paul to found, in 1633, assisted by Madame Le Gras, the first superior, the society of "Daughters of Charity," and to lay the foundation of all modern religious communities who lead an active life devoted to various works of charity. The great need of such a society had become so obvious that the holy see, which had hitherto discouraged every attempt of a kindred character, solemnly approved of "The Daughters of Charity" in 1655. In their constitution it was enacted that the community was "to consist of girls, and widows unencumbered with children, destined to seek out the poor in the alleys and streets of cities." In their founder's words, they were "to have for monastery the houses of the sick; for cell, a hired room; for their chapel, the parish church; for their cloister, the streets of the town or wards of the hospital; for enclosure, obedience; for grating, the fear of God; for veil, holy modesty."

The order spread with wonderful rapidity, and now numbers between 30,000 and 40,000 sisters, with 2,000 houses over the world, devoted to every conceivable work of charity. Outside of France they have houses in Algeria, Belgium, Austria, the British Isles, Italy, Russia, Poland, Portugal, Spain, Switzerland, the Levant, Palestine, China, the United States, Guatemala, Panamá, Ecuador, Peru, Brazil, La Plata, Chile. In 1891 they undertook the care of a hospital at Jerusalem, at the request of the pasha, by whom at its opening they were received with great ceremony. All

Sisterhoods

are in connection with the mother house, Rue de Bac, Paris, and are under the superioress, who is elected every three years, and who resides there. After five years' probation the sisters take vows, renewable every year. Their habit is gray-blue cloth, with large white collar, and white *cornette* for the head.

After St. Vincent de Paul's sisters, the "Little Sisters of the Poor" rank next in numbers and in variety of active labors. They were founded in 1840 at St. Servan, in Brittany, by the Abbé le Pailleur, then but 25, and a young girl, Marie Jamet, a poor needle woman. She was soon joined by another poor girl, Virginie Tredaniel, scarcely 16, and shortly after by an old servant, Jeanne Jugan, whose name is now known throughout the length and breadth of France, and who at 48 had saved 600 francs ($120). The institute was formed for the special object of the care of the aged, destitute, and sick poor. Jeanne Jugan received from the French Academy the "prize for virtue," *i. e.*, a grant of 3,000 francs ($600) awarded every year to the person who is judged to have surpassed all others in works of charity. The recipient is said to be "crowned by the French Academy." This sum was applied to building their first house at St. Servan, the Abbé le Pailleur selling his gold watch and other effects to help them; and the work begun thus humbly half a century before had by 1892, when the venerable founder and Marie Jamet (then mother general) were still living, become one of the most imposing and important charitable institutes of our time, possessing 270 houses, with 4,400 sisters. The mother house established at La Tour in 1856, contains 600 novices from all parts of the world; and from this single center are directed the work of their thousands of sisters and the affairs of their houses all over France, besides those in Germany, Italy, Spain, Portugal, Belgium, the British Isles, Sicily, America, Africa, India, Ceylon, and Australia. The institute was definitely approved by Leo XIII. in 1886 — the object, "the care of aged people of both sexes, irrespective of creed."

The "Sisters of Mercy" (of Troyes) were also founded in 1840 by Abbé Miller, canon of the cathedral at Troyes, for the purpose of nursing the sick in their homes. There are now 115 houses of this "congregation" in Europe, seven in Africa, and one in New York. In time of war the sisters nurse the soldiers on the battlefield and in the ambulances. There is another order of "Sisters of Mercy" (of Notre Dame), founded in 1824 by Archbishop Quélen.

A heroic sisterhood was formed in 1868 by Cardinal Lavigerie, called "of the African Mission," for the care of 300 Arab orphans after the great Algerian famine. They have been pioneers of civilization as well as Christianity, ploughing and planting vineyards with their own hands, and in 1892 had 11 different houses scattered through North Africa — among the Kabyle Mountains, on the edge of the desert, and along the coast of Algeria. One of their chief works is the reception and education of negro children rescued from slave dealers. In July, 1891, three of these sisters were brought, at the request of the King of Dahomey, to visit him; they were received with great pomp and sent away with large presents, among which were three girls between 10 and 15. Many other smaller societies of sisterhoods devoted to the care of the poor exist abroad; but, after France, Ireland has by far taken the lead, both in the rapid growth of such societies and in the number of women she has given to the work. Indeed, considering the smallness of her population, 4,700,000, she has probably far surpassed every nation in Europe in this charitable work.

The "Irish Sisters of Charity" were founded in Dublin in 1815 by Mary Aikenhead, daughter of a gentleman of good Scotch family who had settled in Cork. The society is on the same lines as that of St. Vincent de Paul, but entirely distinct from it. They have now nearly 500 sisters, with 23 houses in Ireland and one in England, besides four houses in Australia not depending on the mother house. They are occupied in almost every kind of charitable work — orphanages, hospitals, penitentiaries, schools, convalescent homes, blind asylums, and certified industrial schools for girls under government, of which 4,121 girls were inmates in 1890. The other great sisterhood in Ireland is that of the Sisters of Mercy, founded in 1831 in Dublin by Catharine McAuley. The object of this institute is "all works of mercy, corporal and spiritual, especially education." There are now at least 500 houses of these sisters in existence in all parts of the world. In their jubilee year, 1881, 168 houses had been founded in Ireland alone. This is quite the most remarkable development of an order of sisters in the world, considering that the whole population of Ireland is less than that of London.

Of sisterhoods belonging to the Anglican communion the first foundation was made in 1845 by Dr. Pusey and Lord John Manners (afterward Duke of Rutland), who, assisted by a few friends, opened a small house in Albany Street, Regent's Park, to receive a few women desiring to devote themselves to charitable works. Since then the spread of English sisterhoods has been scarcely less rapid than that of their Roman sisters in Ireland. The sisters are engaged in all kinds of charitable works —

missions in the worst parts of London, schools for both the poor and those of a higher class, and have built splendid convalescent hospitals, receiving both men and women, at Clewer, at Folkestone, and at Torquay. They have now five houses for different objects at Clewer, 14 in London, and 14 in other parts of England. They have also a branch in America, of which the mother house is at New York; and in Calcutta they have charge of the Lady Canning Home, the nursing of the European General Hospital and of the Medical College and Eden Hospitals; also of the Pratt Memorial School, the European Orphanage Asylum, and the hospital at Darjeeling, etc. The sisterhood of St. Peter's was founded in 1861 by the late Benjamin Lancaster, Esq., and his wife. The sisters have several other houses, including a convalescent hospital on the high heath and pinewood grounds above Woking Station. They also have mission houses under the parochial clergy in three parishes in the E. of London and at Sydenham.

The first sisterhood in England, that founded by Dr. Pusey, was broken up in 1855, after the war in the Crimea, where some of the sisters had worked under Florence Nightingale. A few of the original members of this first Engl sh sisterhood joined a small community v hich had been founded by Miss Lydia Sellon in 1849, called the Society of the Holy Trinity. One of the largest and most important sisterhoods in England was founded in 1851 under the title of "Sisters of the Poor," by the late Miss Harriet Byron. St. Margaret's Sisterhood was founded at East Grinstead in 1854 by the Rev. Dr. J. M. Neale for the purpose of nursing the sick poor or rich in their homes. The Holy Cross Sisterhood, whose headquarters are at Holy Cross Home, Hayward's Heath, was formed in 1857 to aid in the St. George's Mission work, under the Rev. Charles Lowder, a task in which they persevered for 20 years of hand-to-hand fight with the heathenism of Ratcliffe Highway. One of the most flourishing sisterhoods in England — that of St. Mary's, Wantage — was founded by the Rev. Dr. Butler, afterward Dean of Lincoln, primarily for penitentiary work. The "Sisters of Bethany," founded in 1866, have their headquarters in Clerkenwell, and are chiefly devoted to education and to mission work in poor parishes. St. Raphael's Sisterhood, Bristol, founded in 1867, follows, as far as possible, the rule of St. Vincent de Paul, and is devoted entirely to the service of the poor; middle-class education and penitentiary work being excluded.

The "Sisters of the Church," Randolph Gardens, Kilburn, founded in 1870 by Miss Emily Ayckbowm, developed with extraordinary rapidity, as regards the number of sisters, now nearly 150, the immense number and variety of its work, and the large scale on which each separate branch is carried on. They have immense schools, teaching many thousands of children, and training homes for teachers. It would be impossible to enumerate all their works in connection with mission work: restaurants for workingmen, a night refuge for men, food trucks for the unemployed, depôts for the sale of second hand clothing, and an accident hospital at Rotherhithe.

Besides these large communities there are many smaller sisterhoods in England: All Hallows; Sisters of the Holy Name, founded in 1865; St. Katharine's, at Fulham, founded in 1879; St. Laurence's Sisterhood, Belper; St. Agnes' Sisters, Birmingham; St. Mary's Sisters, Brighton; etc.

The first Protestant sisterhood in the United States was organized in 1852 by the Rev. W. A. Muhlenberg, rector of the church of the Holy Communion, New York, and author of the hymn, "I Would Not Live Always." The sisters took charge of St. Luke's Hospital, which he founded in 1859. Since then a number of sisterhoods have sprung up all over the country, notable among them being: The Sisterhood of St. Mary, New York city, founded in 1865; the Sisterhood of St. John Baptist, New York city, affiliated in 1881; the All Saints Sisters of the Poor, Baltimore, Md., affiliated in 1890; and the Sisterhood of St. Margaret, Boston, Mass., established in 1873.

Sister Isle, The, Ireland, so named with reference to England.

Sisters of Mercy. See SISTERHOODS.

Sisters of St. Peter. See SISTERHOODS.

Sisters of the Church. See SISTERHOODS.

Sistova, a town of Bulgaria; on the Danube, opposite Simnitza; 38 miles S. W. of Rustchuk, beautifully situated on undulating slopes. It has 19 mosques and 5 churches, and carries on manufactures of wine, leather, and wool. Here was signed, on Aug. 4, 1791, a treaty of peace between Turkey and Austria. Sistova was a place of some importance in the Russo-Turkish war. Part of the Russian army crossed the Danube here, and the town fell into their hands on June 27, 1877. Pop. about 14,000.

Sistrum, in music, a jingling instrument of ancient Egypt. It had four loose rods in a lyre-shaped metallic head. It was, in fact, a rattle made of bronze or silver, according to ability. It was used in the services of Isis or Athor, which were introduced into Rome before the Christian era, and is still employed in Christian churches in Nubia and Abyssinia.

Sisymbrium, a genus of plants, order *Brassicaceæ*. The hedge mustard, *S. officinale*, is a common and troublesome weed in fields, roadsides, etc., throughout the United States.

Sisyphus, in mythology, a descendant of Æolus, said by some to have lived at Ephyra, on the Peloponnesus, while others allege that he was a robber, slain by Theseus. His punishment in Tartarus for his crimes committed on earth consisted in rolling a huge stone to the top of a high hill, which constantly recoiled, and thus rendered his labor incessant.

Sisyrinchium, a genus of plants, order *Dioscoreaceæ*, comprising grass-like plants, with compressed, ancipital scapes. *S. anceps*, the blue-eyed grass, is a delicate little plant, with blue flowers, common in low grass-lands in Canada and the United States.

Sita, in mythology, wife of Râma, or Vishnu incarnate, carried off by the giant Ravana. She was not born, but arose from a furrow when her father, Janaka, King of Mithila, was plowing. The word means "furrow."

Sítápur ("the town of the goddess Sita"), the chief town of the district of the same name, in the province of Oude, British India; 105 miles S. E. of Bareilly and 51 N. W. of Lucknow. It was formerly the site of an important military cantonment, and the headquarters of the Khyrabad division. In June, 1857, the three battalions of native infantry and Oude Irregulars mutinied. Most of the European residents, civil and military, were immediately killed, a few escaped for the time, two women and one child alone survived, to be ultimately rescued from their prison in the Kaiserbagh at Lucknow, in March, 1858.

Sitiophobia, or **Sitiomania,** in mental pathology, the refusal to take food, a common symptom in persons suffering from melancholia. It may proceed from hallucination or from anorexia, the sensation of hunger being scarcely experienced, but in either case the mechanical administration of food is necessary.

Sitka, or **New Archangel,** a port of entry and seat of administration of Alaska Territory; on the W. coast of the island of Sitka or Baranof; about 1,300 miles N. of San Francisco. It is located amid beautiful scenery, and has a wide and deep harbor, somewhat difficult of entrance. Its bay, dotted with evergreen islands, opens out into the Pacific, and within view are river, forests, and snow-covered mountains. Ferns and mosses are found in great variety. It is said that on the small island of Sitka there grow more than 300 kinds of wild flowers. The town contains a hospital, museum, an industrial and public school, the Greek Church of St. Michael, built in 1816, and in which the Russians still maintain the national religion, and a Presbyterian mission, where about 200 boys and girls receive an industrial training in connection with the ordinary branches of an English education. The principal business establishment, that of the Russian-American Fur Company, organized in 1799, was located here till 1863. When Alaska was transferred to the United States in 1867, Sitka contained only about 100 log huts. Since then it has made considerable progress and a number of substantial buildings have been erected. Pop. (1900) 1,396; (1910) 1,039.

Sitting Bull, a chief of the Sioux Indians; born about 1837; was regarded as a great "medicine man" by his tribe; and was an obdurate foe of the whites, even violently repulsing all overtures toward a peaceful understanding. He manifested this hatred from youth till the day of his death. He was conspicuous in the Sioux massacre of 1862; was constantly on the war path for 14 years; was a leader in the Indian outbreaks of 1876; and was in command at the battle of the Little Big Horn in which General Custer and his entire force were killed. With his band he escaped into Canada, but continued even there to incite rebellion among the Sioux. In 1880, receiving the promise of pardon, he returned to Dakota and surrendered to General Miles. It is a question whether the acceptance of the condition of pardon was sincere, for he again incited the Indians to renewed outbreaks. His arrest was ordered and the Indian police were detailed on this duty. In attempting to resist them, Sitting Bull was killed Dec. 15, 1890.

Sium, in botany, the water parsnip; a genus of *Umbelliferæ*, family *Amminidæ*. Bracts and bracteoles many; calyx-teeth small or obsolete; petals obcordate, with an inflected point, white; carpels, with five rather obtuse ribs, and two or more vittæ in the interstices; suture with vittæ; fruit ovate or globose, subdidymous, crowned by the depressed base of the reflexed styles. Known species four.

Siva (a Sanskrit word, literally meaning "happy," "auspicious"), the name of the third god of the Hindu Trimurti or triad, in which he represents the characters both of Destroyer and Reproducer. The name Siva, as that of a deity, is unknown in the Vedic hymns, but established as such in the epic poems, Puránas and Tantras. The Saivas, or worshipers of Siva, assign to him the first place in the Trimúrti; and to them he is not only the chief deity, but the deity which comprises in itself all other deities. Thus, in the Siva-Purána, he is addressed as Brahma,

Vishnu, Indra, Varuna, as the sun and the moon, as earth, fire, water, wind, etc.; but even in the Puránas relating to Vishnu his power is exalted in praise and he is addressed with the utmost awe. The symbol of Siva is the Linga, emblematic of creation, which follows destruction. From each of his numerous attributes or characteristics he derives a name or epithet. He has five heads (hence his name *Panchánana*, "the five-faced"); three eyes (hence his name, *Trinctra*, "the three-eyed"), one of which is on his forehead, and indicates his power of contemplation; and in the middle of his forehead he wears a crescent. His hair is clotted together and brought over the head so as to project like a horn from the forehead. On his head he carries the Ganges, whose course he intercepted by his hair, when this river descended from heaven, so as to enable the earth to bear its fall. Round his neck he carries a garland of human skulls. In his hands he holds the trident, a club or pole armed at the upper end with transverse pieces representing the breastbone and ribs adjoining, and surmounted by a skull and one or two human heads.

Siva is doubtless a combination of an Aryan god and a non-Aryan deity — his wild and terrible attributes being doubtless derived from the pre-Aryan indigenous belief. Among his weapons are a bow, a thunderbolt, and an axe. As the destroyer of the world, he is also called Kála ("Time" or "Death"), and represented as of black color. One of his representations is also half-male and half-female, emblematic of the indissoluble unity of the creative principle. He is clothed in a deer skin; or he also holds a deer in one of his hands; or he sits on a tiger skin, or is clothed in it. When he rides, the bull Nandi is his beast of burden, whom he also carries as an emblem in his banner. He resides on the wonderful mount Kailása, the N. peak of the Himalaya, where he also rules over the N. E. quarter. His principal wife is variously called Devi, Durgá, Umá, and Kálí, and is the great goddess of modern worship. One of his chief attendants is Tandu, who is one of the original teachers of the arts of dancing and mimicry, whence Siva is the patron of dancers. Besides Tandu, a host of other attendants and companions, together with demons and other beings surrounding him, are named by the Puránas.

Among the principal achievements of this god is his conflict with the god Brahma, who was originally possessed of five heads, but lost one through exciting the anger of Siva by disrespectfully addressing him. Siva is especially worshiped under the symbol of the Linga; but there are periods at which homage is paid to him also under other forms, corresponding with the description given above. Siva and Vishnu are nowadays in their male and female forms practically the gods of the Hindu population. Like Vishnu, Siva has 1,000 names by which he is addressed; some derived from his exterior attributes have been mentioned above; among the others the principal are Isa or Iswara ("lord"); Mahesa or Maheswara ("the great lord"; Sankara ("the conferrer of happiness"); Rudra ("the terrible"); or Mahárudra ("the very terrible"); and Mahádeva ("the great god").

Sivalik Strata, in geology, certain freshwater strata found in the Sivalik Hills in Sirmoor, etc. They were originally regarded as Miocene, but Mr. Blanford believes that, while the Lower Sivalik or Nahun beds are not older than Upper Miocene, the mass of the strata is Pliocene. They have been investigated by Dr. Hugh Falconer, Sir Proby T. Cautley, Lieuts. Baker and Durand (Sir Henry Durand), and by the Geological Survey of India — leading to a series of publications beginning in Calcutta in 1836. They yielded mollusca belonging chiefly to living species. Forty-eight genera and 93 species of mammalia, some recent, others extinct, have been described; they include *Macacus*, *Semnopithecus*, *Felis*, *Machairodus*, *Elephas*, *Mastodon*, *Rhinoceros*, *Equus*, *Hipparion*, *Hippopotamus*, *Cervus*, *Sivatherium*, *Antilope*, *Capra*, *Ovis*, *Camelus*, *Mus*, and *Hystrix*. Some species have lingered on in the Nerbuddah and the Godavery valley to the Pleistocene, with flint implements.

Sivas, a town in Asiatic Turkey, near the center of a large and fertile plain watered by the Kizil Irmak, 410 miles E. S. E. of Constantinople. It has numerous mosques, large and well-supplied bazaars, commodious khans, baths, etc. Being on the road from Bagdad, and having easy access to the Black Sea, it commands a considerable trade. Pop. 43,000.

Sivash, or **Putrid Sea,** a lagoon on the N. E. border of the Crimea, South Russia, separated from the Sea of Azov by a narrow strip of land called the Tongue of Arabat. In summer and autumn it becomes a vast marsh giving off pestiferous vapors, hence its name.

Sivatherium, in palæontology, a genus of *Antilopidæ* or *Sivartheridæ*, with one species, *S. giganteum*, discovered by Falconer and Cautley in the Sivalik Hills. It must have been far larger than any living ruminant, for the skull was nearly as long as that of an elephant. Dr. Falconer considered that it connected the Ruminantia with the Pachydermata. It had two pairs of horns; the anterior pair simple, the posterior possessing two snags or branches.

Six Acts, six repressive measures passed in England in 1819 to prevent seditious

assemblies and unauthorized military training, punish seditious libels, increase the power of the magistrates, and further restrict the liberty of the press. They were very unpopular, and are known as the "Gagging Acts."

Six Articles, Statute of, a law made by Henry VIII., and styled "An Act for Abolishing Diversity of Opinions." It was passed on June 7, 1541, and came to be commonly known as the "bloody statute." It enacted that if anyone did deny the doctrine of transubstantiation (1), he should be burnt; and that if anyone preached, taught, or obstinately affirmed or defended that the communion in both kinds was necessary (2), or that priests might marry (3), or vows of chastity be broken (4), or private masses not used (5), or that auricular confession was not expedient (6), it should be felony. The act was at first vigorously enforced; but after undergoing some mitigation in 1544 it was finally repealed in 1549.

Six Companies, an organization of Chinamen with headquarters in San Francisco, Cal., partly benevolent and partly commercial, their functions being to loan money, give advice, act as bankers, care for the sick, and protect their countrymen in all ways. Originally, they guaranteed to send back, dead or alive, the body of every Chinaman who sailed from home to this country, but they now ship back to China the bones only of those whose families desire those relics buried in the sacred earth of the Flowery Kingdom. They began in 1850 and 1851 hiring men in China to meet the demand for labor in California. The business grew and other Chinese firms went into it. Then the agents of all these firms found it necessary to unite for self-protection. There were six of these agencies, and they called themselves the Six Companies. A contractor in need of newly imported labor goes to one of these companies and gives his order for so many men. He pays the fees for that number to the company he deals with — the fees varying with different companies from $2.50 to $10. If he hires laborers already here they will be members of the company, and the charge will be only the rate exacted for the service. The names of the Six Companies are: the Ning Yeung,, the Hop Wo, the Kong Chow, the Yung Yo, the Sam Yup, the Yang Wo. They are secret societies only to the initiated; to the rest they do not differ widely in their main design from the societies which white men established in California during the gold fever, when people from every State in the Union had their headquarters there. The Six Companies have added arbitration bureaus and banking operations to their original scheme.

Six Nations. See IROQUOIS.

Six-principle Baptists, an American sect of Baptists, claiming descent from the original settlement of Roger Williams at Providence, R. I., in 1630. The six principles from which they derive their name, are repentance for dead works, faith toward God, the doctrine of baptism, laying on of hands, resurrection of the dead, and eternal judgment (Heb. vi: 1–3).

Sixtus, the name of several popes:

SIXTUS I., successor of Alexander I. in 119; martyred in 127.

SIXTUS II., the successor of Stephen I. He is stated to have been an Athenian and pagan philosopher before his conversion to Christianity. He was one of those who suffered martyrdom in the persecution of the Christians by Valerianus in 258.

SIXTUS III., successor of Celestin I. in 432. He endeavored to reconcile the disputes existing in the Eastern Church, particularly in the case of Cyril, Bishop of Alexandria, and John of Antioch. Some of the epistles which he composed with regard to those controversies are extant, and are included in the collection of Constant. He was also a munificent patron of learning, and is stated to have left 5,000 silver marks to be expended in the embellishment of ecclesiastical structures. He died in 440.

SIXTUS IV.; born in Savona, July 22, 1414; was the son of a fisherman on the coast of Genoa, but became a monk of the order of the Cordeliers. His abilities procured him the chair of divinity at Padua and other universities of Italy. He also became general of his order, and was honored with the cardinalship by Paul II., whom he succeeded in 1471. He is accused of having been a participator in the conspiracy of the Pazzi, the object of which was to destroy the Medici family. He also endeavored to raise a new crusade against the infidels, but without success. He died Aug. 13, 1484.

SIXTUS IV.

SIXTUS V., (Felice Peretti), Pope; born near Montalto, Dec. 13, 1521. He entered the convent of the Cordeliers at Ascoli, and by his natural good abilities and his popularity as a preacher made his way rapidly, notwithstanding a petulant temper and frequent contentions with his associates. He was successively Professor of Theology, commissary-general of his order at Bologna, and inquisitor at Venice, whence he fled to Rome and obtained still

higher honors and offices. A remarkable change appeared in his character or manners — he showed himself meek and amiable, and ingratiated himself with all who had to do with him. Pius V., who had been his pupil, got him chosen general of the Cordeliers, named him his confessor, and, in 1570, created him cardinal. He was not in favor with Gregory XIII., and it is said that in his retirement he feigned great feebleness, walked leaning on a stick, his head declined, and his voice broken. These signs of old age vanished with surprising suddenness the moment of his election as successor to Gregory in April, 1585. He threw away his staff, lifted up his head, and made the place ring with his loud *Te Deum*. His first care was to repress brigandage, and make Rome and the States of the Church safe from the violence which had long prevailed. One year of his vigorous government made an immense and beneficial change. Before the end of 1585 Sixtus published a bull of excommunication against Henry of Navarre and the Prince of Condé. After the murder of the Duke of Guise and the Cardinal of Lorraine, he cited Henry III. of France to Rome, and on his non-appearance excommunicated him. During the five years of his pontificate Sixtus formed and executed many great designs for the improvement and adornment of Rome at a cost which made him so unpopular with the people that after his death they destroyed his statue. He caused the famous granite obelisk which Caligula had brought from Egypt to be set up on a pedestal; completed a great aqueduct for the supply of Rome with water; rebuilt the library of the Vatican, and established the celebrated printing office in connection with it; had new editions of the "Septuagint" and the "Vulgate" published at his own expense, and yet left the treasury rich. Sixtus confirmed the order of "Feuillants"; established or reformed many congregations for the management of secular or ecclesiastical affairs, and fixed the number of cardinals at 70. He died in Rome, Aug. 27, 1590.

SIXTUS V.

Sizar, a student of the lowest rank at the University of Cambridge, England, who eats at the public table, after the Fellows, free of expense. The sizars were probably so called from being originally employed in distributing the size, or provisions.

Size, a kind of glue or adhesive varnish used in many industrial pursuits. House-painters' size is prepared from shreds of leather boiled and strained; papermakers use two kinds, one made from hide cuttings, alum, and soap, and a second of rosin and potash; and the size employed in gilding, japanning, etc., is variously composed of linseed oil, copal, red leather, litharge, vermilion, etc., with turpentine.

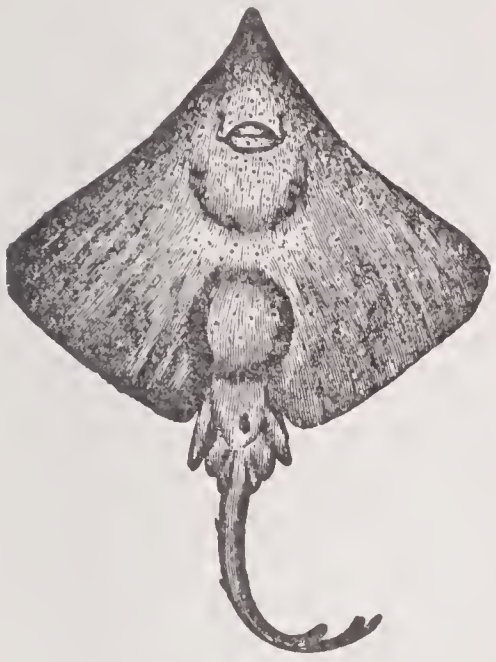
Skagen, Cape, or **The Skaw,** the extreme N. point of the province of Jutland, Denmark. A lighthouse, 67 feet high, built by Frederick II. in 1564, is situated on the cape. The village of Skagen, close by, has 2,000 inhabitants.

Skager Rack, a broad arm of the German Ocean, which washes Norway on the N., Jutland on the S., and Sweden on the E., where it communicates with the Cattegat; length, W. S. W. to E. N. E., about 150 miles; breadth, 80 miles. Its depth varies from 30 to upward of 200 fathoms. There are several good harbors on the Norwegian and Swedish coasts.

Skaguay, a town on Chilkat Inlet, Alaska; at the head of Lynn canal, and at the entrance to the White Pass. It is a result of expeditions to the Yukon gold fields in 1897, when the White Pass began to be used as a means of reaching the Klondike and its vicinity. In 1899 the first college in Alaska was opened here with 50 pupils and Dr. La Motte Gordon, a graduate of Oxford University, as president. Skaguay is a miner's town, and a landing place for steamers. Its name is derived from the Indian name of a river which flows into the sea near the town.

Skald, in old Norse, a poet. The name was given specially to that class of poets who exercised their art as a vocation requiring a learned education — *i. e.*, a knowledge of the construction of verse, and of the enigmatical imagery, roughly shaped out of obscure tradition, to which Scandinavian poets were prone. The principal aim of the skaldic poetry was to celebrate the deeds of living warriors or of their ancestors. Very few complete skaldic poems are extant; but there are a great number of fragments preserved, partly in the younger Edda, partly in the Sagas and the Heimskringla.

Skate, in ichthyology, the popular name of any individual of a section of the genus *Raia,* differing from the rays proper in having a long pointed snout. *R. batis,* the true skate, is one of the commonest fishes in European waters, and attains a large size. The upper part of the body is dusky gray or mottled. The long-nosed skate (*R. vomer*), between four and five feet in length, has the snout excessively prolonged. The burton skate (*R. marginata*) is thicker and heavier than the true skate, and is frequently eight feet long; the shagreen skate, or ray (*R. fullonica*), is rather less than three feet long, and, as its flesh is soft and dry, is much less esteemed as a food fish than the other species.



COMMON SKATE.

Skating, progression on ice accomplished by means of instruments composed of steel blades which are fastened to the soles of the boot, and which are called skates. In early times the shin bones of animals were bound to the feet, and skaters glided over the frozen surface on these by propelling themselves with the aid of a spiked stick. At a later period the iron or steel blades were introduced, the cutting edge of which enabled the wearer to dispense with the stick, and to push off with one foot and glide on the other with alternate strokes. Stow tells how the London 'prentices used to "tie bones to their feet and under their heels," and by that means slide on the ice; and Evelyn, under date Dec. 1, 1662, describes how "divers gentlemen performed before their Maties on the new canal in St. James's Park, with scheets after the manner of the Hollanders." Skates are now of two kinds — viz., those made for speed skating and those for figure skating. Both were formerly constructed by inserting the steel blade into a wooden bed, which was approximately shaped to the foot and bound to it by means of leather straps. Modern skates are made entirely of metal, and are fixed either by screws passing through plates (to which the blade is attached) into the sole of the boot, which form of skate is known as the Mount Charles; or they are fixed to the boot by various mechanical devices which enable the skate to be quickly and firmly attached to the boot, and as quickly removed. Of these the skate known as the Barney and Berry is the most reliable.

Many speed skaters continue to use the wooden bed skate. The blades of skates for speed skating are made very thin, about one-tenth of an inch, somewhat longer than the foot, and very slightly convex along the whole length of that part of the blade which comes in contact with the ice. Speed skating as a pastime has lately come greatly into vogue owing to the encouragement given to it by the National Skating Association, and the Fen men of the E. counties of England not only beat all British competitors, but hold their own and frequently win at the international contests in Holland, Norway, and Sweden.

Skates for figure skating are broader and deeper in the blades, rounded at both toe and heel, and with a curvature along the whole length equal to that of a circle having a 7-foot radius. The Edinburgh Skating Club (1642) is the oldest club for encouraging figure skating in Great Britain, but the figures skated were of an elementary character till after the formation of the Skating Club, London (1830). The members of this club instituted a series of combined movements known as "The Skating Club Figures," which have induced a mode of skating peculiar to Great Britain, consisting as it does of large and bold curves and turns, executed with great power and quietness, while the body of the skater is held upright, and the knee of the traveling leg is kept quite straight. Figure skating is now much practised in the United States, Canada, Holland, Germany, Norway, Sweden, and Denmark; but the nature of the skating in vogue is calculated to excite astonishment at the acrobatic dexterity displayed rather than pleasure at the grace and elegance of the gliding movement which should distinguish good figure skating. The skates used for this style of skating have a radius of about 5 feet, and this curvature is given to the blade to facilitate the rapid turns and short curves which are practised in this mode of skating. At St. Moritz, Davos Platz, and Grindelwald there are excellent ice rinks, much frequented during winter by English visitants.

The following are the best amateur skating performances on record:

Distance.	Time.	Record Holder.	Date.
	H. M. S.		
50 yards	6	S. D. See	Dec. 28 1885
		C. B. Davidson	Dec. 28, 1885
75 yards	8 3-5	S. D. See	Dec. 30, 1883

Distance.	Time.	Record Holder.	Date.
100 yards	11 3-5	J. S. Johnson	Mar. 1, 1893
120 yards	15⅞	J. S. Johnson	Mar. 1, 1893
150 yards	17 2-5	G. D. Phillips	Jan. 27, 1883
200 yards	20 1-5	J. S. Johnson	Feb. 26, 1893
		J. Nilssen	Feb. 1, 1896
220 yards	31 2-5	W. Caldwell	Feb. 6, 1897
300 yards	39 3-5	G. D. Phillips	Dec. 30, 1883
440 yards	46 4-5	J. K. McCulloch	Jan. 27, 1896
546.8 yards*	55¼	A. Naess	Feb. 5, 1897
600 yards	1 20 2-5	O. Rudd	Mar. 5, 1893
880 yards	1 47	J. Nilssen	Feb. 1, 1896
1,093.61 yards*	2 13	J. K. McCulloch	Feb. 10, 1897
1,320 yards	2 40 4-5	J. S. Johnson	Feb. 26, 1894
1,640.42 yards	2 41½	J. K. McCulloch	Feb. 6, 1897
1 mile	5 42 3-5	O. Rudd	Feb. 14, 1896
2 miles	8 48 2-5	O. Rudd	Jan. 25, 1895
3 miles	9 25 2-5	J. Nilssen	Feb. 2, 1895
5,000 meters†	12 00½	J. K. McCulloch	Feb. 10, 1897
		A. Nilssen	Feb. 13, 1894
4 miles	14 24	A. Schiebe	Feb. 13, 1894
5 miles	31 11 1-5	O. Rudd	Feb. 20, 1896
10 miles	49 17 3-5	J. S. Johnson	Feb. 26, 1894
15 miles	1 06 36 2-5	A. D. Smith	Jan. 26, 1894
20 miles	1 53 20	A. D. Smith	Jan. 26, 1894
30 miles	2 34 46	J. F. Donoghue	Jan. 26, 1893
40 miles	3 15 59 2-5	J. F. Donoghue	Jan. 26, 1893
50 miles	4 07 00 3-5	J. F. Donoghue	Jan. 26, 1893
60 miles	4 55 15 3-5	J. F. Donoghue	Jan. 26, 1893
70 miles	5 41 55	J. F. Donoghue	Jan. 26, 1893
80 miles	6 25 57 3-5	J. F. Donoghue	Jan. 26, 1893
90 miles	7 11 38 1-5	J. F. Donoghue	Jan. 26, 1893
100 miles	9 4-5	J. F. Donoghue	Jan. 2 , 1893

* Respectively 500, 1,000, and 1,500 meters. † 3 miles, 188.06 yards.

Le Roy See skated a half mile in 1.25 1-5, and a mile in 2.56 4-5 in the Pittsburg (Pa.) rink, Feb. 14 and 15, 1901. These are claimed to be the fastest indoor records ever made by an amateur.

Arthur G. Keane won the figure skating championship of America in the St. Nicholas Rink, New York, Jan. 25, 1901. His total score of points was 90; Irving Brokaw was second with 69, and W. F. Duffy third with 64. Former holders of this championship—1900, A. G. Keane; 1899, A. G. Keane; 1898, A. G. Keane; 1897, G. D. Phillips; 1896, H. S. Evans; 1895, G. D. Phillips; 1894, G. D. Phillips.

Skeat, Walter William, an English Anglo-Saxon scholar; born in London, Nov. 21, 1835. In 1883 he became Professor of Anglo-Saxon at Cambridge; was one of the founders of the English Dialect Society; and an authority on early English literature. He edited "The Vision of William Concerning Piers Ploughman" (1867–1885); Barbour's "The Bruce" (1870–1889); "Specimens of English Literature, 1298–1579" (1871 and 1872); numerous poems, metrical romances, etc.; and has compiled "An Etymological Dictionary of the English Language" (1879–1881; 1884), his chief work. One of his recent publications is an edition of Chaucer (1894).

Skee. See Ski.

Skeleton, a general term for the more or less hard parts of animals, whether forming an internal supporting framework—an endoskelcton, or an external exoskeleton, often useful as armor. The term includes so many different kinds of structure and material that it is necessary to take a survey of reprcsentative types.

Skelcton of Invertebrates.—Many of the Protozoa have shells of lime, or of flint, or of some organic substance, such as acanthin. These are formed by the living matter of the units, in the case of the lime and flint shells from materials absorbed from the surrounding water, but in what precise way we do not know. Almost all sponges are supported by loose or firmly fused spicules of lime or of flint, or have, as in the bath sponge, an interwoven supporting skeleton of "horny" fibers. The spicules or fibers are formed by cells in the middle stratum of the sponge. Among cœlenterates various forms of skeleton, both external and internal, both limy and "horny," are represented by the different kinds of corals. With few exceptions these skeletons are produced by cells belonging to the outer layer or ectoderm of the animal. Worms have little that can be called a skeleton, though some authorities would compare the sheath of the proboscis in nemertea to the notochord of vertebrates. The tubes, calcareous or otherwise, in which many sedentary worms are sheltered, have no vital connection with the animals which make and inhabit them. Echinoderms tend to be very calcareous: lime is deposited in the mesodermic tissue of the body in almost any part, though predominantly near the surface. Most arthropods have well-developed exoskeletons, cuticles formed from the epider-

Skeleton

mis, consisting in great part of an organic basis of chitin, on which, in crustaceans and most myriapods, carbonate of lime is also deposited. As this cuticle is not always restricted to the outside of the animal, but sometimes extends inward, an apparent endoskeleton arises — *e. g.*, in the lobster, the king crab, and the scorpion. Most mollusks have shells in which carbonate of lime occurs along with an organic basis conchiolin, and in cuttlefish there is a remarkable development of cartilage around the nerve centers in the head — an analogue of the skull in vertebrate animals. From this rapid survey it will be seen that the skeletons of invertebrates are very varied alike in structure and in composition; if we except a few doubtful hints of a supporting axis there are no homologies between the skeletons of invertebrates and vertebrates; to the latter, moreover, that form of tissue which we call bone is exclusively restrieted.

Skeleton of Vertebrates.— Here we must distinguish first of all between the external exoskeleton and the internal endoskeleton. The scales of fishes, the scales and scutes of reptiles, the scales, claws, and even feathers of birds, the remarkable bony armature of armadillos, the seales of pangolins, the claws of carnivores, the quills of porcupines, and even the hair of ordinary mammals illustrate the variety of structures which may be ineluded within the anatomical conception of an exoskeleton. All these structures are formed in the epidermis, or in the dermis, or in both combined. Tortoise shell and the seales of reptiles are epidermic; the scutes of croeodiles and the plates covering armadillos are dermic; the seales of elasmobranch and ganoid fishes are due to both layers. But it is difficult to carry out any rigidly logical elassification. Thus, the dorsal shield of a tortoise is physiologically an exoskeleton, but structurally it is in great part formed from the dorsal vertebræ and from what in other animals form the ribs. The ventral shield of a tortoise is formed from dermal bones, and the so-called abdominal ribs of crocodiles arise as ossifications in the fibrous tissue which lies underneath the skin and above the muscles. The teeth of elasmobranch fishes are undoubtedly homologous with the dermal denticles or skin teeth which occur over the skin, and the teeth of mammals are started by enamel germs which sink in from the epidermis of the mouth.

The Vertebral Column.— In a primitive vertebrate animal like the lancelet the body is supported by a median dorsal axis, and, apart from slight supports for the mouth, the pharynx, and the median fin, this is all the skeleton. The median dorsal axis, which in the lancelet has not even the firmness of cartilage, is called the notochord, and is one of the constant characteristics of the skeleton of vertebrates. There is a hint of it in the proboseis of balanoglossus and in cephalodiscus; it is more distinct in the tail of young ascidians, and persists throughout life in appendicularia; in the lancelet, in the hag, and in the young lamprey it is an unsegmented rod with a simple sheath; in the adult lamprey there are above the notoehord rudimentary arches of cartilage forming a trough in whieh the spinal eord lies; in eartilaginous ganoid fishes, such as the sturgeon, in the chimæra type, and in the dipnoi cartilaginous arches appear both above and below the notochord, but there are as yet no vertebral bodies. These begin in the elasmobranch fishes, in which the notochord is, in part at least, constricted by the encroaehment of its sheath, and divided into vertebræ. In the bony ganoids, such as lepidosteus, the vertebræ are ossified, and so they are more or less thoroughly in all the higher vertebrates. Yet it is not the notochord whieh is ossified, but its sheath; the notochord in all higher vertebrates being merely a provisional structure, an internal scaffolding around whieh its "substitute," the baekbone, is built. Each vertebra generally consists of the substantial body or eentrum, the neural arehes whieh form a tube for the spinal cord and meet above it in a neural spine, the transverse proeesses whieh project laterally and are usually connected with ribs, and the artieular processes which bind vertebra to vertebra so that a firm and yet flexible backbone results.

A breastbone or sternum to which the ribs are ventrally united occurs in many reptiles and in all birds and mammals. It arises from a cartilaginous tract uniting the ventral ends of the ribs. In amphibians also there is a breastbone, but there are no distinct ribs, and it is not certain that we ean compare this sternum with that of higher vertebrates.

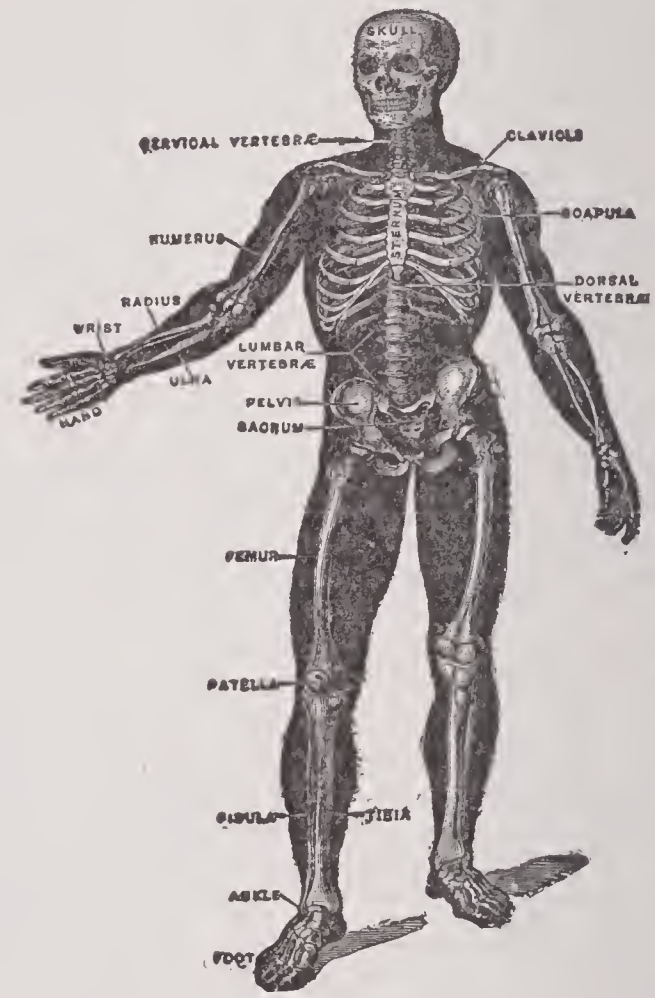
The Skull.— In a young vertebrate animal the cavity in whieh the brain lies is surrounded by a membranous sheath, but this is gradually replaced, first by a gristly brain box, and afterward in most cases by an almost entirely bony skull. Let us first consider the gristly brain box or chondrocranium. (*a*) Its foundation is formed from two pairs of eartilaginous plates — posterior parachordals and anterior trabeculæ — which lie beside and in front of the notochord. These are extended upward by a further formation of cartilage; the end of the notochord may also help a little; the result is a cartilaginous brain box. (*b*) But to the sides of this are added a pair of cartilaginous nasal capsules in front, and a similar pair of auditory capsules behind. (*c*) About the mouth there are some lip or labial eartilages, which may help in forming the skull; but mueh more important is a

series of cartilaginous "branchial arches" (never more than eight pairs), which loop round the pharynx, running between the primitive gill clefts. Of these arches the two most anterior, which are called the mandibular and the hyoid arches, are of great importance in the development of the skull; the others form supports for the pharynx, and are permanently important only in fishes and in gilled amphibians. In elasmobranch fishes the mandibular and hyoid arches do not form any direct part of the gristly brain box, but in the teleosteans and thence onward they, or the bones which replace them, contribute directly to the upbuilding of the skull. To follow the history of the arches, which undergo numerous transformations, is one of the most difficult and interesting tasks of comparative anatomy. (*d*) When a bone develops in direct relation to a preëxistent cartilage which it replaces, it is often called a primary or "cartilage bone"; and there are many regions of the cartilaginous brain box which in the course of development are thus replaced by bones. But there are other bones which develop independently of preexistent cartilage. They invest the cartilaginous brain box on its roof, on its floor, and on its sides. They are comparable to the dermal ossifications or scutes which occur in ganoid fishes and many other animals, and they are often called secondary or "membrane" bones. In structure they are of course indistinguishable from "cartilage bones"; in origin too they are in one way the same, for all bones arise from a (periosteal) membrane of bone-making cells; but "cartilage bones" are at one time represented by cartilages, whereas "membrane bones" never are.

To sum up, the skull is formed (*a*) from the parachordals and trabeculæ at the end of the notochord, (*b*) from the adjacent sense capsules of the nose and the ear, (*c*) from the more or less intimately associated mandibular and hyoid arches (*d*) from the ossification of the gristly brain box due to (*a*), (*b*), and (*c*), but also from "membrane bones" or investing bones which arise independently of preëxistent cartilages. There is no skull in tunicates or in the lancelet; it is cartilaginous in cyclostomata and elasmobranchs; centers of ossification and investing bones begin with the ganoid fishes, and are numerous in teleosteans and in all higher animals. In the development of the individual there is a parallel progress.

Theory of the Skull.— About the beginning of the 19th century Oken and Goethe independently suggested what is known as the vertebral theory of the skull — an undoubtedly suggestive theory, to which Owen lent the strength of his authority, but which has been disproved by the subsequent discoveries of comparative anatomy and embryology (see SKULL).

The Appendicular Skeleton.— Somewhat apart from the axial skeleton are the limbs and the girdles to which these are attached. No secure conclusion has yet been reached as to origin of the limbs of vertebrates. In the simplest forms — the tunicates, the lancelet, the cyclostomata — there are none, and there is a very marked difference between the fin-like limbs of fishes and the fingered and toed limbs which occur in almost all higher backboned animals. According to Gegenbaur, the pectoral and pelvic girdles are structures comparable to the branchial arches, and he supposes that the primitive limbs were made up of modified



HUMAN SKELETON.

fin-rays comparable to those which support the unpaired fins of fishes. According to Dohrn the limbs are residues of a longitudinal series of segmentally arranged outgrowths, perhaps comparable to the appendages of a typical annelid worm.

The pectoral or shoulder girdle consists of a dorsal shoulder blade or scapula, a ventral coracoid, with the articulation for the arm between them, and of a forward-growing collar bone or clavicle. The pelvic or hip girdle consists on each side of a dorsal ilium, a ventral ischium, with the articulation for the leg between them, and of a third pubic portion. The fore limb — from amphibians onward — consists of a humerus articulating with the girdle, a lower arm composed of radius and ulna ly-

ing side by side, a wrist or carpus of several elements, a hand with metacarpal bones in the palm and with fingers composed of several joints or phalanges. The hind limb — from amphibians onward — consists of a femur articulating with the girdle, a lower leg composed of tibia and fibula lying side by side, an ankle region or tarsus of several elements, a foot with metatarsal bones in the sole and with toes composed of several joints or phalanges. Distinct from all the other bones are a few little "sesamoids" which are occasionally developed within tendons and near joints, notably, for instance, the knee pan or patella.

The Skeleton of Man.— As the bones of all the chief parts of the human body are described in separate articles, we need not do more than unify these by reference to a diagram of the entire skeleton. Altogether there are more than 200 bones, but some which are originally distinct become fused with their neighbors.

In the vertebral column there are originally 33 vertebræ, but in adult life the normal number is 26, for, while the first 24 remain distinct, five (the 25th to the 29th inclusive) unite to form the sacrum supporting the hip girdle, and the four hindmost fuse more or less completely in a terminal tail piece or coccyx. Seven cervicals support the neck; 12 dorsals form the greater part of the back and bear ribs; five lumbars occur in the loins; these are followed by the sacrum and the coccyx.

The ribs, or elastic arches of bone which bound the chest, are normally 12 on each side. Most of them articulate dorsally with the bodies of two adjacent vertebræ and with the transverse processes of the posterior one; ventrally the first seven pairs are connected with the median breastbone by means of intervening cartilages, while the posterior five pairs are more or less free.

The skull consists in early adult life of 22 separate bones, but originally there were more, and as life continues the number may be further reduced by fusion. For the various bones see SKULL.

The skeleton of the arm includes 30 bones — in the upper arm the humerus, which articulates with the shoulder girdle; in the forearm the radius and ulna, which articulate with the humerus at the elbow; the wrist of eight carpal bones; the five metacarpals of the palm; the five digits, of which the four fingers have each three joints or phalanges, while the thumb has two. The important bone of the pectoral girdle is the shoulder blade or scapula. To this, at the shoulder joint, there is fused a small beak-like bone — the coracoid — which is separate in birds and reptiles, but reduced to a mere process of the scapula in all mammals except the monotremes. Stretching from the breastbone to shoulder blade is the curved collar bone or clavicle.

The skeleton of the leg also includes 30 bones — in the thigh the femur, which articulates with the hip girdle; in the lower leg the shin bone or tibia and the splint bone or fibula, which articulate with the femur at the knee joint, where there lies a little "sesamoid" bone — the patella; in the ankle region seven bones, then five metatarsal bones forming the sole of the foot, and five toes with the same number of phalanges as in the fingers. The pelvic girdle consists in early life of three paired bones — large dorsal ilium, a posterior ischium, an anterior pubis on each side — but these unite about the 25th year into a single haunch bone with the socket of which the thigh articulates.

Skelligs, The, three rocky islets off the S. W. coast of Ireland, W. of Bolus Head, county Kerry. There is here a lighthouse, visible 18 miles.

Skelton, John, an English poet; born about 1460, probably in Norfolk. He studied at both Oxford and Cambridge, and from the former received the laureateship (then a degree in grammar). He was tutor to the Duke of York, afterward Henry VIII.; was rector of Diss and curate of Trompington in 1504, and was appointed *orator regius* to Henry VIII. His satirical attacks incurred the resentment of Wolsey, and Skelton had to take refuge in the sanctuary at Westminster, where the abbot afforded him protection till his death in 1529. His works comprise among others the drama or morality of "Magnyfycence"; a satire on Wolsey, entitled "Why Come Ye Not to Courte?"; the "Tunning (that is the brewing) of Elynor Rummyng," a humorous picture of low life; and the "Book of Phylyp Sparrow."

Skenea, in zoölogy, a genus of *Littorinidæ*, made by Tate the type of the family *Skeneidæ*. Shell minute, orbicular, few whorled; peristome continuous, entire, round; operculum paucispiral. Number of species doubtful. Distribution, Norway and Great Britain, etc. Found under stones at low water.

Skene, William Forbes, a Scotch historian; born in Inverie, in Kincardineshire, June 7, 1809. He was educated at Edinburgh High School; in Germany; and at the universities of St. Andrews and Edinburgh, afterward in 1831 becoming a writer to the Signet in Edinburgh. In 1881 he succeeded Hill Burton as historiographer for Scotland. Among his most important works are: "The Highlanders of Scotland" (2 vols. 1837); "The Dean of Lismore's Book. a Selection of Ancient Gaelic Poetry" (1861); "Chronicles of the Picts and Scots" (1867); Fordun's "Cronica Gentis

Scotorum" (2 vols. 1871); "The Four Ancient Books of Wales" (2 vols. 1868); "Celtic Scotland, a History of Ancient Alban" (3 vols. 1876–1880); and "Memorials of the Family of Skene of Skene" (New Spalding Club, 1887). He died Aug. 29, 1892.

Skerrett, Joseph Salathiel, an American naval officer; born in Chillicothe, O., Jan. 18, 1833; was appointed to the United States navy in 1848 and later assigned to duty with the African squadron engaged in the extermination of the slave trade. His prineipal service during the Civil War was in June, 1864, when, as commander of the gunboat "Aroostook," he successfully attacked the Confederate fortifications at the mouth of the Brazos river, Texas. Subsequently he eommanded the apprentice ship "Portsmouth"; was on duty at the Naval Academy, and when at Honolulu prevented the outbreak of the threatened revolution of 1873. While commanding the "Richmond," of the Asiatic station, in 1881–1884, he visited Apia, Samoa, where he settled the trouble in which the United States eonsul had become involved. In 1884–1886 he was at the Naval Asylum in Philadelphia; in 1892–1893 was commander of the Pacific station; and in 1893 became commander of the Asiatic squadron. He died in Washington, D. C., Dee. 31, 1896.

Skerryvore Lighthouse, a lighthouse built on a rock forming part of an extensive reef lying about 12 miles S. W. from the wild Isle of Tyree on the W. eoast of Scotland. Lying in the fairway of vessels making for the Clyde and Mersey, it was long the terror of mariners. The reef is exposed to the mighty "fetch" of the Atlantic. The rock on which the tower is built is eomposed of gneiss worn so smooth by the eontinued action of the sea that the foreman mason eompared landing on it to elimbing up the neck of a bottle. In order that the light might show far beyond the foul ground, the tower was designed so that it might have a range of 18 nautical miles. The tower is 137 feet 11 inches in height, 42 feet in diameter at base, decreasing to 16 feet at the top, and contains a mass of granite masonry of 58,580 cubie feet. For 26 feet in height the tower is solid, and the contents weigh nearly 2,000 tons. The walls, as they spring from the solid, are 9½ feet thick, gradually diminishing to 2 feet at the top. Above the solid the interior is 12 feet in diameter, divided into nine stories, surmounted by a lightroom and lantern. Operations were eommenced on the rock in 1838, and the light was exhibited in February, 1844, six years being thus occupied in the work. The apparatus is dioptric revolving, the light attaining its greatest brilliance once a minute; the maehinery which drives the apparatus is also employed to toll fog bells. The tower is the tallest and most graceful rock lighthouse in Great Britain, if not in the world. The cost of the work, including the steam vessel, the small harbor for the attending vessel, and the dwellings for the keepers and seamen, was $434,885. The lighthouse, which was designed and erected by the late Alan Stevenson, is a noble monument of his engineering skill.

Sketchley, Arthur, pseudonym of GEORGE ROSE, an English dramatist; born in London, May 19, 1817. He wrote: "Pauline," a drama (1851); "The Dark Cloud," drama (1863); "How Will They Get Out of It," comedy (1864); and about 35 volumes of humorous pieces selected from his contributions to the eomie journals, among them "Mrs. Brown's Visit to the Paris Exhibition" (1867), followed by a series of observations of the same imaginary personage; "In the Highlands" (1869); "On the Grand Tour" (1870); "On the New Liquor Law" (1872); "On the Alabama Claims" (1872); "On Home Rule" (1881); etc. He died in London, Nov. 11, 1882.

Skewback, in architecture, the sloping abutment, in brickwork and masonry, for the end of the arched head of an aperture.

Skew Bridge, in engineering, a bridge in which the passages under and over the arch interseet each other obliquely. There are cases of frequent occurrence in whieh various sorts of passages and courses necessarily eross each other obliquely as well as on different levels, and where it would be difficult or impossible to eonstruct a square bridge which should both have sufficient strength and at the same time leave the lower passage quite clear. In such cases recourse must be had to a different form of arch, placed obliquely to the abutments, and yet exerting its thrust in the direction of the upper passage. Such a structure is called a skew bridge, and is frequently required on lines of railway, which it is important to keep as straight as possible. The diffieulty of building skew bridges increases with the obliquity of the angle from 90° to 45°, which is supposed to be the most hazardous angle for a semicircular arch; but beyond that limit, instead of increasing, it rather diminishes to about 25°, which appears to be about the natural limit for a semi-cylindrical arch. Elliptical oblique arches are deficient in stability, more diffieult to execute, and more expensive than semicircular or segmental arehes.

Skew Wheel, in maehinery, a form of wheel used to transmit a uniform velocity ratio between two axes which are neither parallel nor interseeting.

Ski, large snow-shoes worn in Norway and other extreme N. countries. They are

Ski

light in their construction and are about eight feet long. Without these it would be impossible for the peasants to get about during the months of deep snow, when ordinary walking is impossible. The children wear them and acquire great proficiency in their use, and every village has its competition for speed, style, and leaping. On the first Sunday in February, when the snow is usually at its best condition, an annual "ski" competition is held at Holmenkollen and famous races and "jumps" are made. A leap of 120 feet has been recorded. The ski has become popular in Canada and in some parts of the United States, especially in the Northwestern States, where there is a large Scandinavian population. Here "ski running" has become a prominent feature of winter sport.

There is something peculiarly picturesque and sportsmanlike about a ski runner. The "skis" themselves are long and graceful, having nothing of the clumsy stubbiness of the snowshoes used by the Canadians and Indians. Though there are many shapes, they do not differ in essential points. The skis used in Sweden and Norway are long and narrow strips of wood, varying from 8 to 16 feet in length, and generally from 3 to 4½ inches in width. They run to a point which is slightly curved upward, many having both points curved. First-class skis ought never to be thicker than an inch in the center, and from this point gradually bevel off so as not to be more than a quarter of an inch thick at the ends. This feature is very important, as it gives the necessary grace and elasticity to the ski. Though the sides in most cases are parallel, experts seem to prefer the forms which present the greatest width in front where the upward curve begins. An essential feature of the first-class ski is that the under side has the highest obtainable smoothness as well as being straight and flat. Any clever American boy ought to be able to make a pair of skis, at least for practising purposes. There are many kinds of wood used, the best being birch, elm, ash, maple, oak, and Scotch fir. In Christiania ash is in great favor, while the Finns favor a peculiar species of bog pine found along the marshes.

The fastening of the ski to the feet is very simple, consisting of a loop of leather for the toe and a band which passes from this around the heel of the shoe, thus making the ski and the foot as firm as possible, which is necessary in order to steer well, while full freedom is allowed the heel to rise from the ski at every movement.

When first putting on the ski a balancing stick is necessary, and, indeed, it will be found indispensable for some time; the most skillful runners need but a small stick. The beginner should start out on a level surface which is perfectly smooth, and should not be surprised if his feet insist on becoming entangled with each other, for the hardest thing to do is to keep the ski exactly parallel. In descending the hill the ski must be parallel and close together and one should have a staff to prevent him from going too fast and to guide him as occasion requires, either to the right or left, and the body must be bent forward. Should one forget this last instruction he will find himself sprawled on the snow, his ski only reaching the foot of the hill. The management of the ski is comparatively easy after a few trials. They are driven forward by a peculiar stride, or slide, they are not lifted, and the tendency which the beginner feels to tramp away with them, as if he were on mud boards in the middle of a marsh, must be resisted. The stout staff which the ski runners carry is not only used to steady oneself, but to increase the stride. At the end of the sticks is an iron spike, with wicker work a little above about 10 inches in diameter to prevent the stick from sinking into the snow.

An ordinary ski runner is expected to maintain a gait of 8 or 9 miles an hour for quite a length of time. The longest race on ski, the distance being nearly 140 miles, was run in less than 22 hours, rests included. A race in Christiania won by a peasant in less than 5 hours covered 32 miles, laid out over hilly ground including all kinds of difficulties calculated to test the competitor's skill. The annual tournaments held in the principal cities of Sweden and Norway are the great sporting events of the year and when the noted jumpers are to run the king is sure to attend, the great feature of the sport being the ability to take long flying leaps. The jumping is done from steep hillsides, with a slope of 40° or more. The runner dashes with great speed down the hill, in the middle of which is built a bank, if there should not happen to be a projecting rock to answer the purpose; the terrific speed with which he is going throws him far out in the air, thus enabling him to jump 70 or even 90 feet. One man has a record of jumping 99 feet and having kept his balance when he landed. The perpendicular fall of such jumps is often 40 feet, the height of an ordinary three-story dwelling. To the uninitiated this seems rather dangerous sport, but very few accidents happen, as the jumper has been training for a long time. The sport is so exhilarating that the participants in races do not burden themselves with any superfluous clothing.

But the ski are not used merely for a pastime. In the N. parts of Sweden and Norway they are absolutely indispensable as a means of locomotion, and the inhabitants look on the ski as does the rider his horse. As the schools have their chief ses-

sion in winter, and the school houses are few and far between, the children most invariably take their books under their arm, and, strapping their ski to their feet, gaily slide off to school. When the weather is unusually propitious the teacher often takes his flock for a ski picnic, and they indulge in a run over the glistening snow. The mail carrier, ever welcome in these distant parts, can be seen gliding through the village on his ski. The government has introduced the ski among the troops stationed in the N. provinces and great things are expected from these soldiers on their idealized snow shoes should there be occasion to call them out for active duty in a regular campaign against a possible enemy. Prizes for the best ski runners among the soldiers are always offered. There have been a number of ski tournaments in Minnesota, and the number of ski runners in the United States has increased to an extent that has warranted the organization of a National Ski Association.

Skiagraph, a shadow picture produced by the Roentgen rays.

Skiascope, an apparatus for making observations of the influence of the Roentgen rays on a fluorescent screen. One form of the skiascope consists of a tapering light-tight box, provided at the narrow end with a closely-fitting open cap of black velvet or other soft dark-colored material into which the face will fit closely and exclude light, and at the other end is fixed the fluorescent screen. On looking through the instrument toward an excited Crookes tube placed near it the screen exhibits fluorescence where the Roentgen rays are not interfered with by objects sufficiently dense to obstruct their passage. When objects that are opaque to the Roentgen rays, such as glass, bones, and most of the metals, are intervened a shadow of them appears on the screen. Thus if the human hand is placed between the tube and the screen the Roentgen rays will penetrate the flesh but be obstructed by the bones, producing on the screen a shadow picture of the bones of the hand.

Skid, or **Skeed,** an iron shoe or socket for checking the speed of a carriage when going down hill; it is attached to the carriage by a chain of such length as will permit the wheel to ride on it instead of revolving. In the United States, a lengthy square piece of timber along which something is rolled or by which it is supported. In nautical language, any beam or timber used as a support for some heavy body, to prevent its weight falling on a weak part of the vessel's structure. Also timbers that are laid crosswise in a ship's waist, to sustain the larger boats, the launch in particular.

Skilligalee, or **Skilligolee,** a kind of poor, thin, watery broth or soup, sometimes composed of oatmeal or water in which meal has been boiled; thin, watery porridge served out to prisoners, paupers, etc., in England; a dish made of oatmeal, sugar, and water, formerly served out to sailors in the British navy.

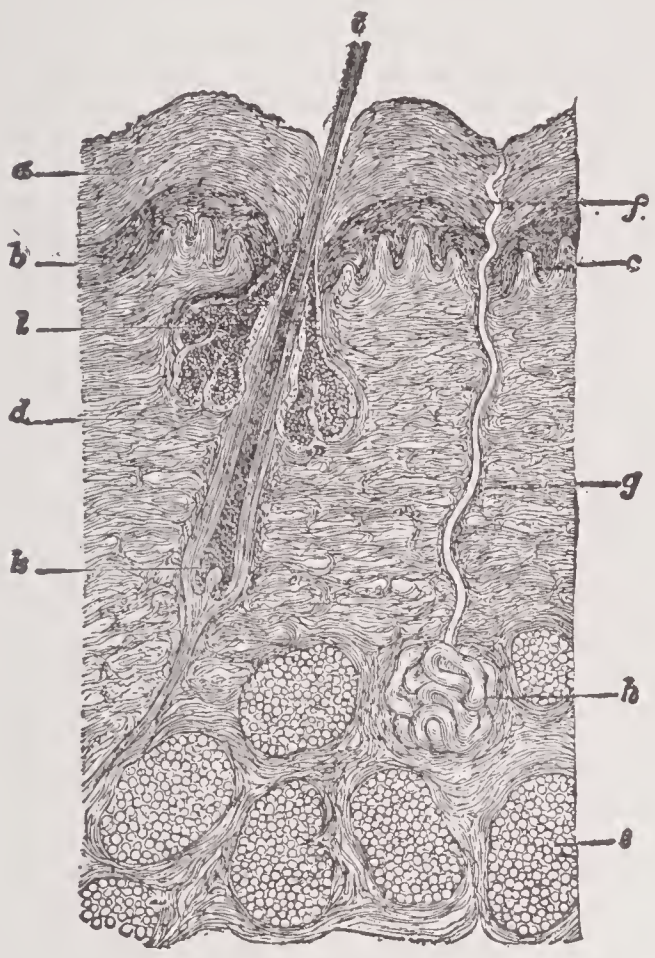
Skimmer, or **Scissors Bill** (*Rhynchops*), a genus of long-winged sea birds belonging to the gull family (*Laridæ*). Their most distinctive feature is the long, thin bill with the lower half longer than the upper. There are only three known species, occurring respectively in Asia, Africa, and America. Darwin describes the American skimmers, or, as they are also called, shearwaters (*R. niger*), as skimming along the surface of the water, generally in small flocks, ploughing up small fish with their projecting lower mandible, and securing them with the upper half of their scissors-like bills.

Skimmington, or **Skimmerton,** a word of unknown origin, but probably the name of some notorious scold; used only in the phrase, "To ride skimmington," or "To ride the skimmington," a burlesque procession in ridicule of a man who allowed himself to be henpecked. The man rode behind the woman, with his face to the horse's tail. The man held a distaff, and the woman beat him about the jowls with a ladle. As the procession passed a house where a woman was paramount, each person gave the threshold a sweep.

Skin, that membrane of variable thickness which covers the whole body externally and extends inward into all the natural openings, where it changes its properties, becoming soft and moist, and hence known as mucous membrane. The skin is generally described as composed of three layers: the cuticle, the rete mucosum, and the cutis vera, the last being the most internal. The cutis (dermis), or true skin, consists of two layers, of which the deeper is called the corium, and the more superficial, the papillary layer. The corium is composed of numerous fibers closely interlaced, and forming a smooth surface for the support of the papillary layer. It varies in thickness, being, as a general rule, thick on the exposed parts and thin on the protected. The papillary layer is soft, and formed by numerous papillæ which cover its whole surface. It contains the expansions of the sensitive nerves. The rete mucosum (mucous network) lies immediately over the cutis, and in some measure diminishes the inequalities of its surface, being thicker between the papillæ and thinner on their summit. It is composed of minute, nucleated cells, and is almost pulpy in consistence. It is very slightly developed in the white races, but is very distinct and thick in those that are darker, the cells, which are filled with a pigment, being that which gives the dark

Skin

color to their skin. The cuticle, scarfskin, or epidermis is a disorganized scaly substance, serving to protect from injury the more delicate cutis. It is thickest on the most exposed parts; and on the palms of the hands and soles of the feet it consists of several layers. The skin performs various important functions. It is the seat

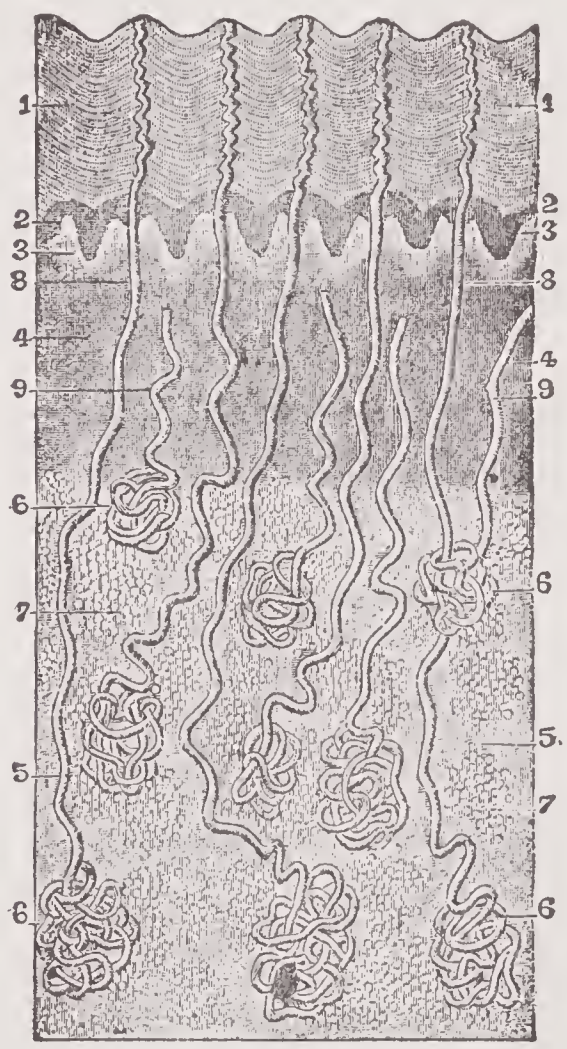


SKIN: SECTION OF A PERPENDICULAR CUT THROUGH HEALTHY SKIN.

a, epidermis, or scarf-skin; b, rete mucosum, or rete malphighii c, papillary layer; d, derma, corium, or true skin; e, panniculus adiposus, or fatty tissue; f, g, h, sweat gland and duct; i, k, hair, with its follicle and papilla; l, sebaceous gland.

of common sensation, and is furnished with numerous pores or openings which give passage to the sweat and other exhalations. It is in this way the great regulator of the heat of the body.

Diseases of the skin are of very different kinds, and of very different degrees of importance. Some are dangerous to life, others are attended with no danger; some are attended with fever and rapid in their course, others are chronic and obstinate; some are disfiguring; some contagious; and so on. The different diseases of the skin may be classified into eight orders, distinguished from each other solely by the appearances on the skin, as follows: (1) *Papulæ*, or pimples, little elevations of the cuticle of a red color, and not containing any fluid, as in the earliest stage of smallpox. (2) *Squamæ*, or scales, small, hard, thickened, opaque, whitish patches of unhealthy cuticle, as in leprosy. (3) *Exanthemata*, or rashes, superficial red patches varying in figure and size, and irregularly diffused over the surface, as in measles, scarlet fever, etc. (4) *Bullæ*, blebs or miniature blisters, as sometimes occur in erysipelas. (5) *Pustulæ*, or pustules, circumscribed elevations of the cuticle containing pus, and having red inflamed bases, as in the eruption of smallpox when at its height and maturity. (6) *Vesiculæ*, or vesicles, small elevations of the cuticle, covering a fluid usually at first clear and colorless, but becoming afterward opaque and whitish, or pearly, as in cowpox and chickenpox. (7) *Tubercula*, tubercles, small, hard, superficial tumors, circumscribed and permanent, or, if they separate at all, it is only partially. (8) *Maculæ*, spots or patches, arising from excess or deficiency of the coloring matter of the skin, and frequently occurring congenitally, or connected with some slight disorder of the digestive organs or of the general health. Such a classification as this is very useful for the purpose of distinguishing the different appearances, but it is of little further service. They are almost all more or less important manifestations in cutaneous tissues of disordered or diseased conditions of one or more of the vital



SKIN: SWEAT GLANDS IN PALM OF HAND (MAGNIFIED).

1, horny layer of epidermis; 2, rete mucosum; 3, papillary layer; 4, derma, or true skin; 5, 7, subcutaneous cellular tissue; 6, 8, 9, sudoriparous or sweat glands.

functions. Besides, a complaint which is papular today may be vesicular tomorrow, and pustular the day following. Some arrangement directing the attention more entirely to the relations and constitutional and visceral dependencies of these affections, and leading to rational and successful methods of cure, is still wanted.

Skin Grafting, in surgery, a method for the treatment of large ulcerated surfaces by the transplantation of small pieces of skin from another part of the body, or from the body of another person.

Skink, or **Scink,** in zoölogy, the popular name for *Scincus officinalis,* or any individual of the family *Scincidæ,* considered by some naturalists as forming a connecting link between the lizards and the serpents, since it contains individuals which are lacertiform, others having rudimentary limbs, and others again serpentiform in appearance, the external limbs being entirely absent, as in the slow worm. The common skink is from six to eight inches long, reddish-dun, with darker transverse bands, wedge-shaped head, and four short limbs.

Skinner, John, a Scotch song-writer; born in Balfour, Aberdeenshire, Oct. 3, 1721. His songs were very popular; among them were "Tullochgorum," reckoned by Burns "the best Scotch song Scotland ever saw"; "Ewie wi' the Crookit Horn"; "John o' Badenyon"; "The Old Man's Song." He wrote an "Ecclesiastical History of Scotland" (1788). He died June 16, 1807.

Skinner, William, an American manufacturer; born in London, England, in 1824; came to the United States in 1845 and engaged in the silk business in Northampton, Mass. In 1848 he became a partner in a silk manufacturing firm, and in 1851 started a factory of his own in Williamsburg, Mass., which was entirely destroyed in the great Mill river flood in 1874. In the same year he started again in Holyoke. He was a noted philanthropist; built a gymnasium for Dwight L. Moody's school in Northfield, Mass., and was a frequent benefactor of Vassar, Smith, and Mount Holyoke Colleges. He died in Holyoke, Mass., Feb. 28, 1902.

Skipper, in zoölogy, the common name of the lepidopterous insects composing the family *Hesperidæ.* They have the body short and thick, head large, eyes prominent, antennæ short, with the knob curved like a hook or bent to one side, legs six, and the four hindmost shanks armed with two pairs of spurs. Skippers fly with a jerking motion, and hence their name. They are generally of a rich brown, marked with yellow spots. The species are quite numerous, and expand from 1½ to 2½ inches.

Skipton, or **Skipton-in-Craven,** a town in the West Riding of Yorkshire, England; on the Aire; 26 miles N. W. of Leeds and 231 N. of London. It is a station on the Midland Railway, and an important junction for Liverpool, Manchester, Blackburn, and Lancashire with Scotland, and where all the important trains stop between London and Scotland. Skipton has a picturesquely situated parish church, and Christ Church, built in 1839. The grammar school is a fine building opened in 1877, and the Midland Railway Company completed in 1876 the erection of a large and commodious station. A reservoir for Skipton was finished in 1877. Skipton is the ancient seat of the Cliffords, whose interesting castle, founded by William de Romillé at the close of the 11th century, still commands the town. The population is partly engaged in agriculture, and the fortnightly cattle fair is one of the largest in that part of England. The town has eight mills, and the chief manufactures are cotton and wincey goods and sewing cottons.

Skirmish, a slight fight in war, between small parties and less than a battle; a loose, desultory kind of engagement in presence of two armies, between small detachments sent out for the purpose either of drawing on a battle or of concealing by their fire the movements of the troops in the rear.

Skirmishers, dispersed soldiers in the first line of battle. They act in front of battalions or masses of soldiers so as to cover the advance of an army and prevent surprises. During recent years the scope of skirmishes has been widely extended in the important modifications of military science represented by the Prussian "swarm" and the British "advance in loose order."

Skirret, the *Sium Sisarum,* a perennial plant of the natural order *Umbelliferæ,* a native of China and Japan, but which has long been cultivated in gardens in Europe for the sake of its roots, which are tuberous and clustered, sometimes six inches long, and of the thickness of the finger. They are sweet, succulent, and nutritious, with a somewhat aromatic flavor, and when boiled are a very agreeable article of food. A kind of spirituous liquor is sometimes made from them. Good sugar can also be extracted. Skirret was at one time more cultivated in Great Britain than it is at present, though there seems to be no good reason for its having fallen into disrepute. Worledge called it the "sweetest, whitest, and most pleasant of roots." It is propagated either by seed or by very small offsets from the roots. It has a stem of two to three feet high; the lower leaves pinnate, with oblong serrated leaflets, and a heart-shaped terminal leaf, the upper ones ternate with lanceolate leaflets.

Skittles, a game in which nine wooden pins are set up on a frame at the end of a short court or alley, the object of the

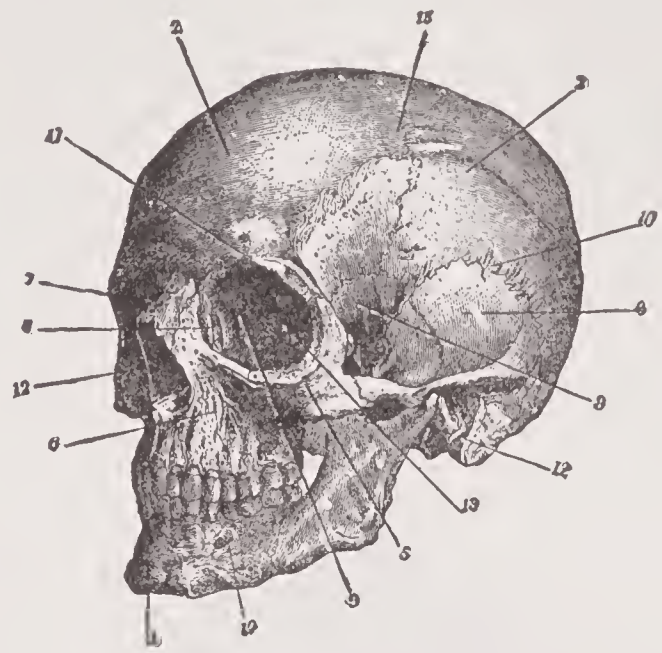
players being to knock over all the pins in as few throws as possible with the skittle ball.

Skobeleff, Mikhail Dimitrievich, a Russian military officer; born in 1841; entered the army as sub-lieutenant in 1861. He distinguished himself against the Poles in 1866, and afterward in Central Asia. In 1876 he was appointed military governor of the province of Ferghana. In the Russo-Turkish War Skobeleff distinguished himself at the second battle of Plevna, and also at Loftscha. In 1878 he was created adjutant-general to the emperor. In 1880 he successfully led an expedition against the Tekke Turcomans, and captured Geok Tepe, Jan. 12, 1881. He was then promoted to the rank of general. He died suddenly in Moscow, July 7, 1882.

Skopelos, an island, one of the Northern Sporades, in the Grecian Archipelago, about 11 miles long and 5 miles broad. The town of Skopelos, on its S. E. shore, is a Greek see and has a number of churches and convents.

Skua, in ornithology, the popular name of any species of the genus *Stercorarius*. They are predatory swimming birds, rarely fishing for themselves, and generally pursuing smaller gulls and terns, and compelling them to drop or disgorge their prey. Four species visit the temperate regions of Europe and America: *S. catarrhactes*, the great skua, which breeds in the Shetland Islands; it is about 24 inches long, and of somber plumage; *S. pomatorhinus*, the pomatorhine skua, 21 inches, dark mottled above, under surface brown (nearly white in old birds); *S. crepidatus*, the Arctic or Richardson's skua, about 20 inches long, ocurring under two different plumages, one entirely sooty, the other with white under parts, and *S. parasiticus*, the longtailed or Buffon's skua, about 14 inches long, upper part of head black, upper surface brownish-gray, under surface white.

Skull. The skull is divided into two parts, the cranium and the face. In human anatomy it is customary to describe the former as consisting of eight and the latter 14 bones; the eight cranial bones, which constitute the brain case, being the occipital, two parietal, frontal, two temporal sphenoid and ethmoid; while the 14 facial bones, which surround the cavities of the mouth and nose and complete the orbits or cavities for the eyes, are the two nasal, two superior maxillary, two lachrymal, two malar, two palate, two inferior turbinated, vomer, and inferior maxillary. The bones of the ear, the teeth, and the Wormian bones are not included in this enumeration. The lower jaw articulates with the temporal bones by means of a diarthrodia joint, but all the others are joined by sutures. On the base of the cranium the occipital and sphenoid bones articulate by means of a plate of cartilage (synchondrosis) in young subjects; in adults this becomes bony union. Sutures are named from the bones between which they are found, but to those around the parietal



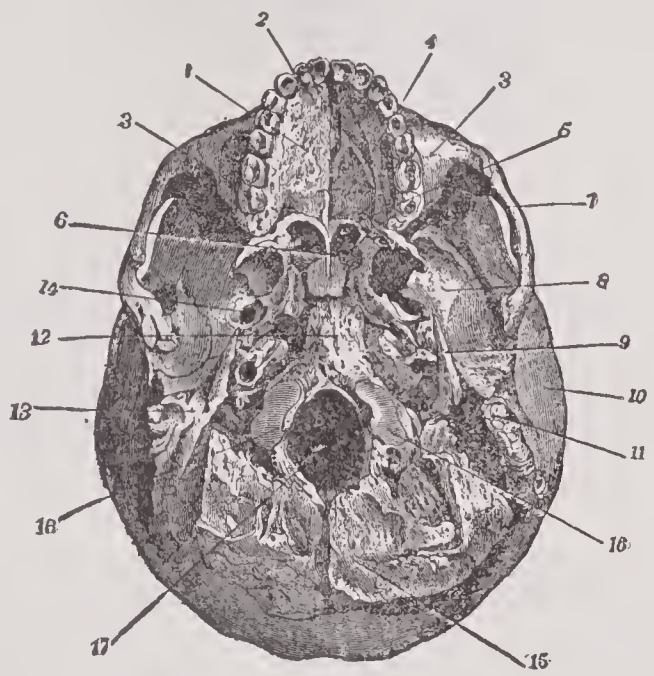
HUMAN SKULL, SIDE VIEW.

1, frontal bone; 2, parietal bone; 3, sphenoid bone; 4, temporal bone; 5, process of the cheek bone; 6, superior maxilla; 7, nasal bone; 8, lachrymal bone; 9, ethmoid bone; 10, inferior maxilla; 11, chin; 12, anterior nasal aperture; 13, optic foramen; 14, mastoid process of the temporal bone; 15, coronal suture; 16, squamous suture; 17, superior ledge of the eye-orbit.

bones special names are given — *e. g.*, interparietal or sagittal; occipito-parietal or lambdoid; fronto-parietal or coronal; parieto-temporal or squamous. During adult life many of the sutures close by bony union and disappear, but both the age at which this occurs and the order of its occurrence are subject to variation. Wormian bones are irregular ossifications found in relation to the sutures of cranial bones, but seldom seen in relation to the bones of the face. They are most frequent in relation to the lambdoid suture, and seldom one inch in diameter. The closure of a suture stops the growth of the skull along that line, and in order to compensate for this defect an increase of growth may occur at right angles to the close suture and thus irregularities of form may result; for example, closure of the sagittal suture stops transverse growth, but the skull continues to grow in the longitudinal and vertical directions, with the result that a boat-shaped cranium is produced — scaphocephaly. Irregular forms may be produced artificially by pressure applied early in life. This is best seen among certain American tribes who compress their children's heads by means of boards and bandages. The bones of the skull are pierced by holes (foramina), and similar holes are found in rela-

Skull

tion to the adjacent margins of bones. Most of these foramina are situated in the base or floor of the skull, and are for the ingress of arteries and the exit of veins and cranial nerves. The largest of these foramina — the foramen magnum — is found in the occipital bone. It is situated immediately above the ring of the atlas vertebra, and through it the continuity between the brain and spinal cord is established, and further, it transmits the vertebral arteries which supply blood to the brain. Compared with the skulls of animals, the form of the human skull is modified (1) by the proportionately large size of the brain and the consequent expansion of the bones which surround it; (2) by the smaller size of the face, especially of the jaws, so that the face of man, instead of projecting in front of, is under the forepart of the cranium; (3) by



HUMAN SKULL, SEEN FROM BELOW.

1. hard palate; 2, alveolar processes of the superior maxilla; 3, bone of the superior maxilla; 4, palatal bone; 5, posterior nasal aperture; 6, the vomer; 7, jugal bone; 8, sphenoid bone; 9, styloid process of the temporal bone; 10, squamous portion of the temporal bone; 11, mastoid portion of the temporal bone; 12, basilar portion of the occipital bone; 13, petrous portion of the temporal bone (with the organ of hearing); 14, oval foramen of the sphenoid bone; 15, occipital portion of the occipital bone; 16, condyle of the occipital bone; 17, foramen magnum.

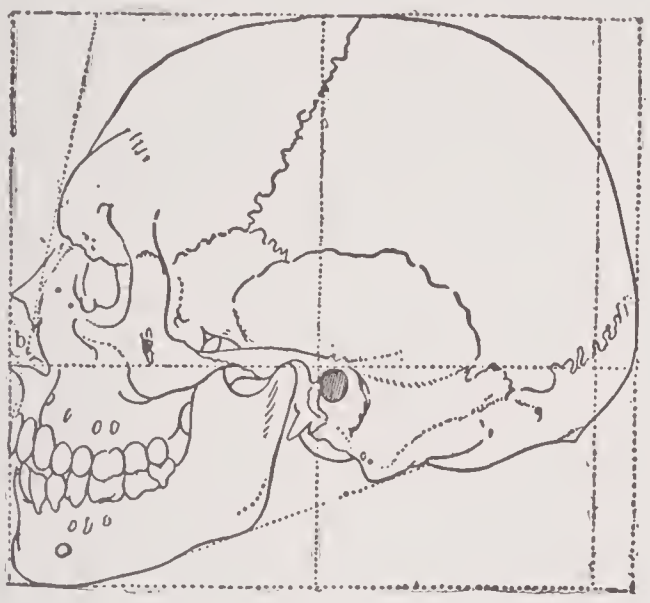
the erect attitude, which places the base of the skull at a considerable angle with the vertebral column, and, in consequence of a development backward from its point of articulation with the vertebræ, the skull is nearly balanced on the summit of the vertebral column. Hence the orbits look forward and the nostrils look downward. The development of the skull is a subject of great interest, not only in itself, but as throwing light on many points which the study of the adult skull would fail to explain.

The fact that concussion of the brain scarcely ever proves fatal, unless there is also fracture of the skull, affords the most distinct evidence that the skull is constructed in such a manner that so long as it maintains its integrity it is able to protect its contents from serious lesion. This marvelous protective power is due to its rounded shape, whereby its strength is increased, and in consequence of which blows tend to glide off it without doing material damage. Moreover, the curved lines or ridges which may be traced round the skull tend to strengthen it. The weakest part of the skull is at the base. Hence, notwithstanding its removal from exposure to direct injury and the protection afforded by the soft parts, fracture takes place more frequently at the base than at any other part of the skull, fracture often taking place here even when the skull was not broken at the part struck. There are two points in the architecture of the bones of the face which deserve special notice — viz. (1) the great strength of the nasal arch; and (2) the immobility of the upper jaw, which is fixed by three buttresses — the nasal, the zygomatic, and the pterygoid.

Morphology of the Skull.— This is the highest and most difficult problem of comparative anatomy, and has cost the most extraordinary labor for its solution. Goethe and Oken independently suggested that the skull was to be regarded as the modification of a series of four vertebræ, and this "vertebral theory" was worked out in the most elaborate detail by Owen and other anatomists. Huxley, however, in a celebrated Croonian Lecture (1858), revised and extended the hitherto neglected embryological observations of Rathke, proposed an unanswerable destructive criticism of the archetypal theory, and may be said to have thus definitely placed the newer view in the way of general acceptance. An enormous amount of detailed research, for which we are indebted chiefly to Parker in England and Gegenbaur in Germany, has established the newer theory on the sure ground of actual observation.

Taking first the simple unsegmented cartilaginous cranium of a skate or dog fish, with its appended jaws and branchial arches, we find that in development, though the notochord extends into the region of the head, the vertebræ stop altogether short of it; but that on each side of the cranium there arise a pair of cartilaginous bars — the trabeculæ or "rafters" of the future skull — and three pairs of cartilaginous capsules, nasal, ocular, and auditory, form round the developing sense organs; the nasal capsules immediately unite with the ends of the trabeculæ, which are meanwhile uniting below and growing up at the sides to form the brain case. The auditory capsules become united with the trabeculæ by the appearance of two new masses of cartilage — the parachordals — the eyes of

course remaining free. At first there are no jaws, but a series of seven or more similar vertical cartilaginous bars or arches, considerably resembling the trabeculæ, between which slits open into the pharyngeal cavity. The first pair of these arches develops an ascending process, which passes above the developing mouth, and becomes the "palato-pterygoid" arch or upper jaw, the original portion remaining as the mandible. The



EUROPEAN SKULL.

second pair of arches — the "hyoid" — becomes more or less modified usually to aid in supporting the jaws and floor of the mouth, while the remaining pairs become little modified, and serve throughout life to support the gills.

The more complex bony skulls of higher vertebrates are now in principle readily understood. The chondro-cranium and subjacent arches in all cases develop in the same way, though reduction and even atrophy of the gill arches subsequently takes place. The bones, though similar in the adult, originate in two utterly distinct ways, either by actual ossifications in the substance of the chondro-cranium and jaws, or by the ossification of overlying dermis, and are hence known as cartilage bones and membrane bones respectively — the latter corresponding to the dermal bones and teeth of ganoid and elasmobranch fishes. In mammals a further extraordinary specialization takes place; the ends of the mandibular and hyoid arches lose their suspensory function, are taken up during development into the interior of the ear capsule, and are metamorphosed into the auditory ossicles.

Various Forms of the Skull.— At birth the frontal and parietal eminences are especially prominent, and the mastoid process is absent. The face is only one-eighth of the bulk of the cranium, whereas in the adult the face is equal to one-half. During the first seven years the skull grows rapidly, and by this time many parts have attained definite size. At the period of puberty the face and regions of the air sinuses undergo expansion. The face elongates owing to the growth of teeth and the increase in the size of their alveolar sockets. In old age the skull may become lighter and thinner or the reverse. Loss of the teeth and absorption of their sockets result in diminution of the size of the face, and thus the upper jaw recedes while the chin becomes prominent.

Sex.— It is not always possible to determine the sex from the skull; but, as a rule, the skull of the male has more strongly marked muscular impressions, while the mastoid processes, superciliary ridges, and air sinuses are more pronounced than in the females, whose skull generally retains the leading features of a young skull.

Race.— In comparing the skulls of different races of mankind it is necessary to have recourse to various methods of measurement, and these are usually conducted on the skulls of adult males. The following is a short summary of these methods: (*a*) Cranial capacity. This is obtained by filling the cranial cavity with shot, and then measuring the quantity in a graduated vessel, special precautions being observed in order to obtain equable results. The capacity of normal human crania varies from 60 to 110 cubic inches — the average in all races being 85 cubic inches — *e. g.*, Eskimo, 91.5; European, 90.3; Chinese and Mongols, 87.3; African Negroes, 82.4; Native Australians (aboriginal), 79.3; Andaman Islanders, 78.1. (*b*) Linear measurement of the horizontal circumference of the cranium. In the adult European male the average is 20.7 inches, and in the female 19.6 inches. (*c*) A third method is by comparison of the relative length, breadth, and height of the cranium. The standard of maximum length is taken as 100, and thus $\frac{100 \times \text{breadth}}{\text{length}}$ = index of breadth or cephalic index; and on this basis skulls are classified in three groups — viz.:

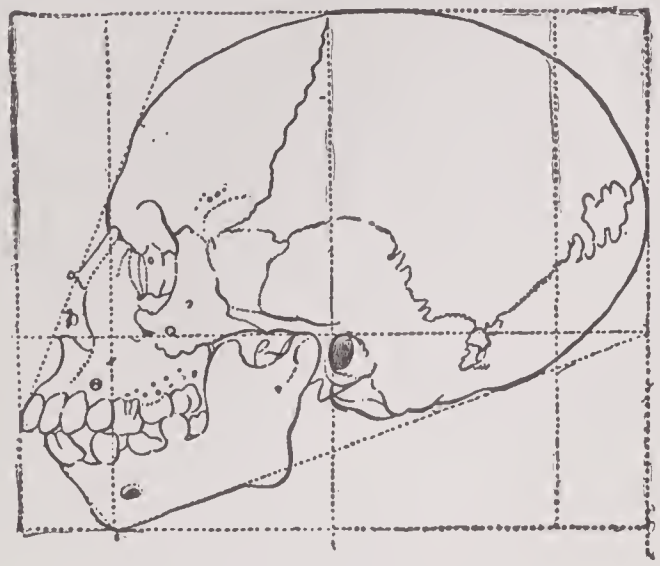
Brachycephalic = breadth-index above 80.
Mesaticephalic = " " from 75 to 80.
Dolichocephalic = " " below 75.

In a similar way the proportion of height to length may be calculated, and a height index established. It varies less than the breadth index — *e. g.*:

	Breadth.	Height.
Mongolians of Siberia and Central Asia	88	73
Andaman Islanders	82	77
Chinese	79	75
English	76	71
Native Australians (aboriginal)	71	71
Fiji Islanders	66	74

(*d*) The degree of projection of the jaws. We have seen that the human skull, when compared with the skulls of lower animals, presents a small face extended vertically, and thus placed under the anterior part of the cranial box. Prominent jaws therefore

indicate an approach to an animal type, especially when associated with a receding forehead. The degree of projection is expressed by the gnathic index of Flower, and is obtained by comparing the basi-alveolar length with the basi-nasal length. When the gnathic index is below 98, skulls are



NEGRO SKULL.

said to be orthognathous; from 98 to 103, mesognathous; above 103, prognathous — *e. g.:*

	Gnathic Index.
English	96
Chinese	99
Eskimo	101
Fiji Islanders	103
Native Australians (aboriginal)	104

(*c*) The form of the nasal skeleton and its anterior openings is also subject to variation, and so its height and width may be measured, and the relation between the two expressed as a nasal index.

Nasal index below 48 = leptorhine.
" from 48 to 53 = mesorhine.
" above 53 = platyrhine.

For example:

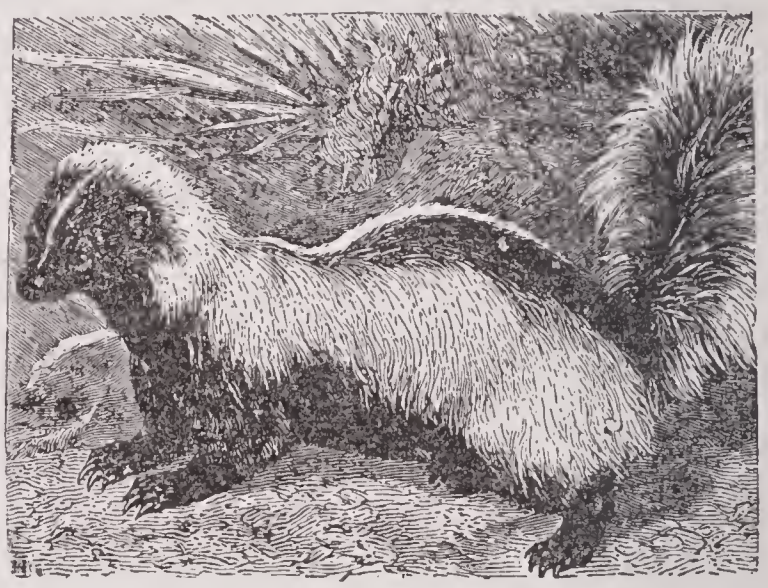
	Nasal Index.
Eskimo	44
English	46
Chinese	50
Native Australians (aboriginal)	57

In a similar way the form of the orbit is subject to variation, but this is of less consequence than the nose. Other measurements of the face skeleton are also made. A time-honored measurement, long thought to be sufficient in itself for founding a classification of races, was the " facial angle " of the Dutch anatomist Peter Camper (1722–1789). This was obtained by drawing one line from the center of the forehead to the most projecting part of the upper jaw just above the incisor teeth, and another from the opening of the ear to the base of the nasal opening; between these was contained the facial angle.

Skunk, the *Mephitis*, a genus of small carnivorous quadrupeds of the family *Mustelidæ*. The body is elongated, and usually much arched; the tail long and thickly

Skunk

covered with long, fine hair; the head small, with thick, blunt snout; the legs short, and the paws comparatively large, with five incompletely divided toes. The general color is black and white. The power, characteristic in some degree of all the *Mustelidæ*, of forcibly discharging the fetid secretion of the anal glands is in the skunks enormously developed. All the species are American, and, as they differ little in habit, the common skunk (*M. mephitica*) may be taken as typical of the whole genus. The common skunk — an animal about the size of a cat — has fur of a glossy black; on the forehead is a patch of white diverging into two lines which extend the whole length of the back and meet again in the beautiful bushy tail. The under surface of the tail is also white, and, as it is usually carried erect or laid over against the body, the white is regarded by some naturalists as a " warning color." Thus Br. Belt writes: " The skunk goes leisurely along, holding up his white tail as a danger flag for none to come within range of its nauseous artillery." The common skunk is found throughout North America, but is most abundant in the Hudson Bay region. It chiefly frequents high-



AMERICAN SKUNK.

lying, bushy, or even rocky districts and the banks of the rivers, remaining concealed in its burrow by day, but emerging at dusk in search of the worms, insects, birds, and small mammals which form its food.

Its movements are slow and leisurely. It never attempts to run away if pursued, for, feeble and defenseless as it looks, it is most efficiently protected by the possession of a nauseous fluid, the discharge of which neither man nor beast will wittingly provoke. Should an unwary intruder venture too near, the skunk turns its back, erects its tail, and, by means of a muscular contraction, ejects the contents of its anal pouches with a force which carries them to a distance of from 8 to 10 feet. So penetrating is the evil odor of this fluid that it is perceptible a mile off, and has been known to

cause nausea in persons within a house with closed doors from which the animal was 100 yards distant; and so persistent is it that clothes defiled by it can only be purified by prolonged hanging in smoke. It is said that the fluid has irritating properties which excite severe inflammation of the eyes, and cases are cited of Indians who have thus lost their eyesight. The skunk is hunted for its fur, which is in considerable demand; but the hunter must be careful to avoid alarming the animal, and thus causing it to discharge its obnoxious fluid. Skunks usually raise from 6 to 10 young in a season. If taken young they are easily tamed and make pretty pets, for they are cleanly in habit and rarely emit their offensive secretion save when provoked. The long-tailed skunk (*M. macrura*) is found in Central and South Mexico, and a much smaller species (*M. putorius*), with four white stripes, ranges from the Southern States to Yucatan and Guatemala.

Skunkbill, Skunkhead, or **Skunktop,** the name given several species of ducks in the United States, as, the surf duck, and the now (supposed) extinct Labrador duck.

Skunk Cabbage (*Symplocarpus fœtidus*), a plant of the natural order *Araceæ* or arums, so named from its smell. The root and seeds are said to be antispasmodic, and have been used as expectorants and as palliatives in asthma.

Skunk River, a river of Iowa whose source is in Hamilton county. Its course is S., crossing Jasper, Mohaska, Keokuk and Henry counties. It flows into the Mississippi about 11 miles below Burlington. The North Skunk, which rises in Marshall county, flows into the main river about 10 miles S. E. of Sigourney. The upper part is sometimes called the South Skunk. It is about 275 miles long.

Skutterudite, an isometric mineral, occurring in individual crystals in a hornblende band in gneiss, frequently associated with cobaltite; hardness, 6.0; sp. gr. 6.74–6.84; luster, metallic; color, tin-white. Composition: Arsenic, 79.2; cobalt, 20.8 = 100, corresponding with the formula, $CoAs_3$.

Skye, after Lewis, the largest of the Scotch islands, and the most N. of the Inner Hebrides, is included in Inverness-shire; area, 547 square miles. Separated from Ross-shire in the N. W. by the Sound of Rona, and from Inverness in the S. W. by the Sound of Sleat, it approaches within half a mile of the mainland between these two channels at Kyle Rhea. It is very irregular in shape, and is so cut up by inlets that no part of it is more than 4 miles from the sea. The chief inlets, all toward the W. and N., are Lochs Eishart, Slapin, Scavaig, Bracadale, Follart, and Snizort; the principal headlands are Aird Point, Ru-Huinish, Dunvegan Head, and Vaternish Point, which are extremities of the peninsulas of Duirinish, Vaternish, and Trotternish in the N., and Sleat Point in the S. Its extreme length from Aird Point to Sleat Point is 47 miles; its greatest breadth, from Portree to Copnahow Head, 22 miles. Skye is a wild, highland country, and its rocky mountains and pale headlands are shrouded in the mists of the Atlantic. The S. portion, however, is "comparatively soft and green," the long promontory of Sleat being the "best wooded, the sunniest, and the most carefully cultivated" part of Skye, with its larch plantations and trim hedgerows.

Toward the S. W., bounding Loch Scavaig, are the romantic Cuchullin Hills, jagged and precipitous, attaining their greatest height of 3,183 feet in Scuirna-Gillean. The outlying Blabhein (pronounced Blaavin), 3,200 feet high, rises to a narrow ledge, overhanging a lofty precipice on either side. Among the Cuchullins lies Loch Coruisk, the most savage scene of desolation in Britain. Its dark-green waters are girt with tiers of cliffs and steep rocky slopes strewn with gigantic masses of hypersthene. Glen Sligachan, "to which Glencoe is Arcady," passes N. between Scuir-na-Gillean and Marscow, to the E. loch of the same name. Near the E. coast, 7 miles N. of Portree, the Storr (2,348 feet) rises conspicuously. Its summit is cut vertically for 500 feet, and is fenced with fantastic pinnacles, while the steep declivity below is littered with detached rocks. In the bleak promontory of Trotternish rises the Quiraing (1,774 feet), perhaps the most singular sight in Skye, happily described as "a nightmare of nature." It is a natural basaltic cathedral, formed by huge fluted columns of basalt and rugged pyramidal masses, in the midst of which stands a truncated rocky hill. This hill, the Quiraing proper, rises abruptly; its sides are worn by rivulets and ribbed with fissures, and at its top is a spacious verdant plateau, 100 paces by 60.

The coast to the S. and E. of the Quiraing presents basaltic formations, at various points rivalling in size those of Staffa and the Giants' Causeway. Here and there the base of the cliffs is hollowed into remarkable caves (*e. g.*, Prince Charles' Cave) and their face is worn by waterfalls. The N. part of Skye is still spoken of as "Macleod's country," and the S. part is the country of the Macdonalds. Macleod's Tables are two contiguous hills in the E. of the island, flat-topped as a dining table, and covered far into spring with a layer of snow. Macleod's Maidens are three spires of rock, rising sheer out of the sea. Skye has no rivers, but the streams at Skeabost, Portree, Ose, Hammer, etc., afford salmon and sea trout fishing. In the bays there are profit-

able fisheries — herring, cod, ling, saithe, oyster, etc. On account of the humidity of the climate, agriculture is almost abandoned, only green crops being produced in any quantity. Sheep farming and cattle-rearing are the chief occupations, and important fairs are held at Broadford. Game, which was formerly plentiful, is now scarce.

The inhabitants are mainly Celtic, and universally speak Gaelic, though the use of English is gradually increasing. There is a strong Norse infusion, and the names of the N. headlands are Norwegian, not Gaelic. Since 1851 the population has decreased, chiefly by emigration, to the extent of one-fifth. The chief families in Skye are the Macdonalds of Sleat, who trace their descent to the Lords of the Isles, and the Macleods, originally Norsemen, who still occupy old Devegan Castle. The island is historically interesting as the home of Flora Macdonald and the refuge of Prince Charles. At the old house of Kingsburgh Flora entertained Dr. Johnson and Boswell in 1773. The grave of Flora in the churchyard of Kilmuir, long in a state of sad neglect, was marked by the erection of an Iona cross, a granite monolith 28 feet high, in November, 1871. In the winter of 1877, however, the monument was blown down and broken into five pieces by a strong gale. There are masterly descriptions of Skye scenery in Scott's "Lord of the Isles," and in Black's "Princess of Thule."

Skye Terrier, a breed of dogs supposed to be the outcome of a cross between the native dog of Skye and a Maltese terrier. The modern skye should be very low at the shoulder, not above 9 or 10 inches high, with as long a body as possible; many good specimens measure 40 inches from nose to tip of tail. The coat should be very long and abundant, nearly touching the ground, but hanging quite straight, without any curl. Color varies from a dark blue to a light gray. The weight should be about 20 pounds. The skye terrier is divided into two varieties, prick-eared and drop-eared. Though many admirers claim working properties for the skye, as now bred it should only be regarded as an ornamental dog. The Paisley or Clydesdale terrier, a variety of terrier brought into notice within the last few years, is a skye with a light-colored and silky coat, and is kept entirely as a house dog.

Skylark, in ornithology, the *Alauda arvensis,* one of the most popular European cage birds from the variety and power, rather than the quality, of its song, and the ease with which its health is preserved in captivity. It is an inhabitant of all the countries of Europe, many migrating S. in winter. The adult male is about seven inches long; feathers on top of head dark brown with paled edges, forming a crest, upper parts brown, each feather with a spot of darker hue; throat and upper part of breast grayish-brown, spotted with dark brown, abdomen yellowish-white, deepening into pale brown on the flanks; tail feathers various shades of brown. The female is a little smaller than the male and somewhat narrower across the shoulders.

Sky-rocket, a firework composed of a mixture of niter, sulphur and charcoal tightly rammed in a stout paper case, which ascends when the compound is ignited at the lower end. A stick is attached to one side of the case to steady the flight.

Skyros, or **Scyro,** an island of the Grecian Archipelago; the largest of the Northern Sporades; 24 miles N. E. of Eubœa; length, 17 miles, area, 79 square miles. Skyros is very mountainous in the S., the mountains being covered with forests of oaks, firs, and beeches; but the N. part, though also hilly, has several fertile plains, which produce fine wheat and grapes for wine. The only town is Skyro, or St. George on the E. coast. This island is associated with the legends of Achilles and Theseus. In 469 B. C. Cimon the Athenian conquered it and carried off to his native city the bones of the hero Theseus. It was likewise celebrated for its goats and its variegated marble.

Sky-scraper, a name given to the very tall buildings to be seen in the larger American cities, particularly New York and Chicago. They are all strong structures supported by steel frames resting on great cantilevers sunk down to bed rock, some 70 feet below the street level. Each portion is dependent on the rest and cannot give way unless the very foundations are riven. For an example of such a building, see the Syndicate Building under NEW YORK.

Sla. See SALLEE.

Sladen, Douglas Brooke Wheelton, an English poet; born in London, Feb. 5, 1856. He wrote "Frithjog and Ingebjorg, and Other Poems" (1882); "Australian Lyrics" (1883); "A Summer Christmas: A Tale of Sport" (1884); "Edward the Black Prince," an epic drama (1886); "Australian Ballads and Rhymes" (1888); "The Spanish Armada" (1888); a ballad; "Australian Poets" (1888); "A Japanese Marriage" (1895); "The Admiral" (1898); etc.

Slafter, Edmund Farwell, an American historian; born in Norwich, Vt., May 30, 1816; was graduated at Dartmouth College in 1840; took a course at Andover Theological Seminary; was ordained in the Protestant Episcopal Church in 1845; and held various pastorates. In 1877 he turned his attention to the study of history. His publications include "Sir William Alexander and American Colonization" (1873);

"Voyages of the Northmen to America" (1877); "History and Causes of Incorrect Latitudes as Recorded in the Journals of Early Writers, Navigators and Explorers" (1882); "John Checkley: or the Evolution of Religious Tolerance in Massachusetts Bay" (1897); etc. Died Sept. 22, 1906.

Slag, in metallurgy, vitreous mineral matter removed in the reduction of metals; the scoria from a smelting furnace. It is used for making cement and artificial stone, in the manufacture of alum and crown glass, and is cast into slabs for pavements, garden rollers, etc. In founding, the fused sullage and dross which accompany the metal in a furnace, and which it is the business of the skimmer to hold back from the ingate. Also the scoria of a volcano.

Slaked Lime, calcium hydrate; produced by sprinkling calcium oxide with water. When a mass of lime is moistened with water, an energetic combination takes place, accompanied occasionally with slight explosions, due to the sudden evolution of steam; the mass splits in all directions, and finally crumbles to a soft, white, bulky powder. It is chiefly employed in the preparation of mortar for building purposes.

Slander, defamation; detraction; calumny; a false tale or report maliciously uttered, and tending to injure the reputation of another; disgrace; reproach; disreputableness; ill-name. In law, slander is of two kinds: one which is actionable as necessarily imparting some general damage to the party slandered; the other actionable only when some special damage has been actually caused. The former includes such words as impute to a person crimes or misdemeanors that are legally punishable in a court of law, such as tend to injure him in his profession, trade, or calling by which he gains his livelihood, as imputing to him malpractice, incompetence, etc.; such as tend to his exclusion from society or to disparage him in an office of public trust. In the other case, the words, though untrue and maliciously spoken, are not in themselves actionable unless the party aggrieved is able to prove that he has sustained some certain actual loss therefrom. The words require to be maliciously spoken; and hence, if spoken in a friendly manner or by way of advice, they are not actionable. There are certain kinds of communications which are regarded as privileged, and therefore not actionable; as when a master is called on to give the character of a servant, or where a man communicates to another circumstances which it is right that he should know in relation to a matter in which they have a mutual interest. If the defendant be able to prove the words to be true, no action will lie for defamation, whether special damage has ensued or not; for the law holds them to be justifiable.

Slang, a low and inelegant, but often expressive, form of colloquial language. Many words which originate as slang finally take their places in the language of literature and speech. The word slang itself, which has occupied a place in the language since the middle of the 18th century, is comparatively a recent word in reputable dictionaries.

Slate, a very remarkable form of clay rock, frequently fossiliferous and not confined to one geological period. Consisting essentially of clay, the particles of slate are so mechanically arranged that the rock splits with perfect facility into almost indefinitely thin layers in one direction only, and in all others either breaks with a jagged edge, or in well defined joints at some distance from each other. Mineralogically slate is nothing more than a pure clay: nor does there seem any reason to suppose that any approach is made in it toward crystalline structure. As, however, no other rock shows this tendency to split indefinitely, the case is one of great interest. Practically slate is very valuable, owing to its peculiar facility of splitting and the perfectly smooth natural face which it presents. Its hardness and compactness preserve it from all weathering by mere exposure, though, when ground down, it easily passes back into fine clay. Slate is always, and properly, regarded as a metamorphic rock. It has certainly undergone much change, though it is not quite certain what the change may have been. For a long time slate was used almost exclusively for roofing. For this purpose the slates are cut into sizes varying from a few square inches to two square feet, though some are much larger. This is done with very simple tools and extreme rapidity. The rest is in slabs or thick slates, often very large. The use of slate and slabs has increased considerably of late years. Slabs are now used in house fittings; as in strong rooms, powder magazines, larders, partitions, baths, stables, floors, drains, etc. For all these and many like purposes its perfect resistance to the atmosphere, to all chemical influences, and to the passage of heat, render it invaluable. It is very largely used also for enamelling; the surface of enamelled slate being made to represent marble of all kinds with wonderful accuracy, and resisting almost all wear. Thus, for mantel pieces, billiard tables, ornamental slabs, and furniture, it has no equal, its cheapness being such as to drive other material out of the market. Quarries of great magnitude are worked in Cornwall, Wales, Scotland, and Ireland. The product of the Welsh quarries was formerly largely exported to the United States, but this business received a serious check on the opening of valuable quarries in Ver-

mont, New York, Pennsylvania, Maryland, and other States.

Adhesive slate is a kind of greenish-gray slate, quickly absorbent of water, and remarkable for its adhesiveness. Bituminous slate, a soft species of sectile slate clay impregnated with bitumen; hornblende slate, a slaty rock consisting of hornblende and feldspar with some chlorite, principally used for flagging. See STONE PRODUCTION.

Slater, in zoölogy, a popular name for various cursorial *Isopods*. The slater, simply so called, is *Oniscus armadillo*, the water slater is the genus *Asellus*, the box slater *Idothea*, the shield slater *Cassidina*, and the cheliferous slater *Tanais*.

Slater, John Fox, an American philanthropist; born in Slaterville, R. I., March 4, 1815; engaged in business and so enlarged his operations that in 1872 he became sole owner of the mill property he was then conducting. He also made profitable investments, and in a few years acquired a large fortune. He was early interested in the cause of education, and gave liberally to the establishment of the Norwich Free Academy and to other institutions. His largest gift was that of $1,000,000 to trustees, in 1882, for the education of the freedmen in the South. He died in Norwich, Conn., May 7, 1884. See SLATER FUND.

Slater, Samuel, an American manufacturer; born in Belper, England, June 9, 1768; was apprenticed to Strutt, Arkwright's partner in cotton spinning, in 1782; came to the United States to promote cotton manufactures in 1789; settled in Pawtucket, R. I., in 1790; and there built and started the first cotton mill in the United States, with 72 spindles and three carding machines. Afterward he built cotton mills at what is now Webster, Mass., and erected woolen mills at the same place in 1815–1816. He was a liberal employer, established schools for the children of his workmen, and thus built up the village of Slaterville, where the business is still carried on by his descendants. In the erection of his mills he was obliged to rely solely on his memory to reproduce the Arkwright machinery, the English laws forbidding the exportation of models. He died in Webster, Mass., April 21, 1835.

Slater Fund, a gift of $1,000,000 made by John Fox Slater, of Norwich, Conn., in 1882, to a board of trustees, for the purpose of "uplifting the lately emancipated population of the Southern States and their posterity." For this patriotic and munificent gift the thanks of Congress were voted, and a medal was presented. Neither principal nor income is expended for land or buildings. Education in industries and the preparation of teachers are promoted in institutions believed to be on a permanent basis. The board in 1910 consisted of William A. Slater, president; Metropolitan Trust Company, treasurer; and Messrs. James A. Stewart, Alexander E. Orr, Cleveland H. Dodge, Seth Low, Wallace Buttrick, Richard H. Williams, Wickliffe Rose, and David F. Houston. General Agent, James H. Dillard, New Orleans; Field Agents, G. S. Dickerman, New York city, and W. T. B. Williams, Hampton, Va. The fund is a potential agency in working out the problem of the education of the negro, and over $750,000 has already been expended. By the extraordinary fidelity and financial ability of the treasurer, the fund, while keeping up annual appropriations, has increased to $1,800,000. Schools established by States, denominations, and individuals are helped by annual donations. Among the most prominent are the Hampton Normal and Industrial, the Spelman, the Tuskegee, and schools at Orangeburg, S. C.; Tougaloo, Miss.; Marshall, Tex.; Raleigh, N. C.; New Orleans, the Meharry Medical College at Nashville, etc.

Slaughter Houses, premises in which cattle are slaughtered and prepared for human food. France took the lead in attending to this important matter; a commission appointed by Napoleon in 1807 brought about a change in the methods of slaughtering, and by 1818 five abattoirs were in operation in Paris. In the United States many cities have provided carefully for this important public necessity. Sanitary authorities are agreed that the establishment of a public abattoir under proper supervision tends to insure the supply of wholesome meat. Buildings for this purpose should be removed from the vicinity of habitations and should be substantially built. The walls should be tiled or cemented, or otherwise rendered impervious to moisture, for a height of at least six feet. Woodwork should be avoided as much as possible consistent with convenience, and what there is should be well painted and frequently washed. To prevent absorption of the fluids and subsequent decomposition, the floor should be composed of roughened cement sloping to a channel. In large slaughter houses the entire body of the animal is used; the horns, hoofs, skin, bones, and blood all being saved for various commercial purposes. The largest slaughter houses in the world are in Chicago, Ill., and Kansas City, Mo. See ABATTOIR: PORK.

Slave Coast, a maritime strip on the W. of Africa, on the Guinea coast, extending between the Volta and Akinga, a stretch of about 240 miles. It consists mainly of long narrow islands. The principal towns on the coast are Badagry and Whydah. A large traffic in slaves was formerly carried on at the ports of this region, hence its name.

Slave Lake, Great. See GREAT SLAVE LAKE.

Slavery, the state or condition of a slave, bondage. Slavery in the full sense of the term implies that the slave is the property or at the disposal of another, who has a right to employ or treat him as he pleases; but the system has been subjected to innumerable limitations and modifications. Slavery probably arose at an early period of the world's history out of the accident of capture in war. Savages, in place of massacring their captives, found it more profitable to keep them in servitude. All the ancient Oriental nations of whom we have any records, including the Jews, had their slaves. The Hebrews were authorized by their law to possess slaves, not only of other races, but of their own nation. The latter were generally insolvent debtors who had sold themselves through poverty or thieves who lacked the means of making restitution; and the law dealt with them far more leniently than with stranger slaves. They might be redeemed, and if not redeemed became free in the space of seven years from the beginning of their servitude; besides which there was every 50th year a general emancipation of native slaves.

Greek Slavery.— In the Homeric poems slavery is the ordinary destiny of prisoners of war; and the practice of kidnaping slaves is also recognized — Ulysses himself narrowly escaping a fate of this kind. None of the Greek philosophers considered the condition of slavery objectionable on the score of morals. Aristotle defends its justice on the ground of a diversity of race, dividing mankind into the free and the slaves by nature; while Plato only desires that no Greeks should be made slaves. One class of Greek slaves were the descendants of an earlier and conquered race of inhabitants, who cultivated the land which their masters had appropriated, paid rent for it, and attended their masters in war. Such were the Helots in Sparta, the Penestæ in Thessaly, the Bithynians at Byzantium, etc., who were more favorably dealt with than other slaves, their condition somewhat resembling that of the serfs of the Middle Ages. They could not be sold out of the country or separated from their families, and were even capable of acquiring property. Slaves obtained by purchase were the unrestricted property of the owners, who could dispose of them at pleasure.

In Athens, Corinth, and the other commercial states they were very numerous, and were mostly barbarians. They were employed partly in domestic service (some being *pædagogi,* employed to accompany the boys to school, etc.), but more as bakers, cooks, tailors, or in other trades, in mines and manufactories, as laborers on country estates, and as seamen and oarsmen; and their labor was the means by which the owner obtained profit for his care and support of them. These slaves were for the most part purchased; but many were born in their master's family. The Athenian state employed public slaves as police, as soldiers, public criers, jailers, etc. An extensive traffic in slaves was carried on by the Greek colonists in Asia Minor with the interior of Asia; another source of supply arose from the practice common among Thracian parents of selling their children. In Greece in general, and especially at Athens, slaves were mildly treated and enjoyed a large share of legal protection. According to Demosthenes a slave at Athens was better off than a free citizen in many other countries. Manumissions were frequent. A master could obtain damages if a slave was maltreated. The slave was not allowed to wear his hair long, was prevented from entering the gymnasia and public assemblies, but had access to temples and festivals. In the palmy days of the Athenian state there were, according to Wallon, 200,000 slaves in Attica; about three times the number of freemen.

Roman Slavery.— In Rome slavery differed in some particulars from that of Greece. All men were considered by the Roman jurists to be free by natural law; while slavery was regarded as a state contrary to natural law, but agreeable to the law of nations, when a captive was preserved, instead of being slain (the name was believed on doubtful etymological grounds to be "*servus,* quasi *servatus*"); or agreeable to the civil law, when a free man sold himself. In earlier times there was no restriction on the master's power of punishing or putting to death his slave, which was generally carried out by crucifixion; and even at a later period, when the law on this head was much modified, slaves were used with great rigor. The estimation in which their lives were held is illustrated by the gladiatorial combats. Old and useless slaves were often exposed to starve on an island of the Tiber. Under Spartacus a rebellion of slaves attained alarming dimensions. In the time of the empire the cruelty of masters was in some degree restrained by law. It was enacted that a man who put to death his own slave without cause should be dealt with as if the slave had been the property of another; and that if the cruelty of the master was intolerable he might be compelled to sell the slave.

Slaves could contract a kind of marriage called *contubernium;* and ultimately this relation was regarded as indissoluble. The children of a female slave followed the status of their mother. There were various ways in which a slave might be manu-

Slavery

mitted, but the power of manumission was restricted by law. The harboring of a runaway slave was illegal. The number of slaves in Rome, originally small, was increased much by war and commerce; and the cultivation of the soil came in the course of time to be entirely given up to them. During the later republic and empire persons in good circumstances kept an immense number of slaves as personal attendants; and the possession of a numerous retinue of domestic slaves was a matter of ostentation — 200 being no uncommon number for one person. A multitude of slaves were also occupied in the mechanical arts and the games of the amphitheater. Originally a slave was incapable of acquiring property, all his acquisitions belonging to his master; but when slaves came to be employed in trade this condition was mitigated, and it became the practice to allow a slave to consider part of his gains, called his *peculium*, as his own, a stipulation being sometimes made that he should purchase his freedom with his peculium when it amounted to a specific sum. Having no legal standing, a slave could not give evidence.

Though the introduction of Christianity did not do away with slavery, it tended to ameliorate the condition of the slave. The fathers taught that the true slavery is not that of the body, but the slavery of sin; and Chrysostom thought the apostle did not insist on the suppression of slavery because it was desirable that men should see how truly the slave could enjoy the liberty of soul. Constantine allowed poor parents to sell their children into slavery. Justinian, though his constitution (A. D. 529) drew a very sharp line between slaves and freemen, did something to promote the eventual extinction of slavery; the church excommunicated slave owners who put their slaves to death without warrant from the judge. But it was not till the reign of Basil (867–886) that the slaves' *contubernium* was hallowed by the blessing of the Church. The number of slaves again increased; multitudes being brought with them by the barbarian invaders, who were mostly Slavonic captives (whence our word slave); and in the countries which had been provinces of the empire slavery continued long after the empire had fallen to pieces.

The doctrine of Von Maurer and Sir Henry Maine has till of late found almost universal acceptance — that the original basis of Germanic societies was a village community of freemen owning the land in common, and that slavery arose by degradation of this social condition. But the researches of Fustel de Coulanges and others tend to show that the evidence for Von Maurer's view is slender, and that probably the earliest state of landed property among the Teutonic tribes was manorial lordship with slavery as an adjunct. In Britain great numbers of the Celtic or other natives were enslaved by the Anglo-Saxons; and the Christian Anglo-Saxons had a regular trade with the Continent in Irish slaves, Bristol being a great slaving port. After the Norman Conquest slaves as a separate class ceased to exist, and slavery eventually merged into the mitigated condition known as serfdom, which prevailed all over Europe in the Middle Ages, and has been gradually abolished in modern times. But though the practice of selling captives taken in war as slaves ceased in the Christian countries of Europe, a large traffic in slaves continued among Mohammedan nations, by whom Christian captives were sold in Asia and Africa; and in the early Middle Ages the Venetian merchants traded largely in slaves, whom they purchased on the coast of Slavonia, to supply the slave markets of the Saracens.

The history of the achievements of the Barbary corsairs is not to the glory of the Christian nations of Europe. These professional sea robbers continued for centuries — down to 1812, indeed — to harry the coasts and the commerce of Europe, carrying large numbers of Christians into all but hopeless captivity. When Cervantes was for five years a slave he had about 25,000 fellow captives in Algiers alone, some treated fairly well, some with great barbarity. Cervantes was ransomed for about $500; $150 or $200 was a more usual price. Another famous slave was St. Vincent de Paul. The order of Trinitarians was founded in 1198 for the purpose of redeeming captives (especially French) out of the hands of the infidels, sometimes bringing away several hundreds at a time; and in the 18th century it was not unusual in English and Scotch churches to make collections for a like purpose. Christians sent to the galleys by their own or foreign authorities were worse off than domestic slaves. English convicts used to be transported to what was practically slavery in His Majesty's plantations; and convict labor is still a kind of judicial slavery for life or a term of years.

Serfdom.— A numerous class of the population of Europe known as serfs or villeins were in a state of what was almost tantamount to slavery during the early Middle Ages. In some cases this serf population consisted of an earlier race which had been subjugated by the conquerors; but there were also instances of persons from famine or other pressing cause, selling themselves into slavery, or even surrendering themselves to churches and monasteries for the sake of the benefits to be derived from the prayers of their masters. Different as was the condition of the serf in different countries and at different periods, his position was on the whole much more favorable than

Slavery

that of the slave under the Roman law. He had certain acknowledged rights — and this was more particularly the case with the classes of serfs who were attached to the soil. In England, prior to the Norman Conquest, a large proportion of the population were in a servile position, either as domestic slaves or as cultivators of the land. The humblest was nearly a slave — the *theow;* the other, the *ceorl*, an irremovable tiller of the ground. The powers of the master over his serf were very extensive, their principal limitations being that a master who killed his serf was bound to pay a fine to the king, and that a serf deprived of his eye or tooth by his master was entitled to his liberty. And English serfdom was always territorial rather than personal.

After the Norman Conquest there were various names used for the serfs, who seem ultimately all to have been confounded in one class, though originally different. The *villein* (*villanus*) was the Anglo-Saxon *ceorl;* less favorably situated were the *bordarii;* but the Anglo-Saxon *theow* (the *servus*) was no longer part of the system of society. Other names in the Norman period were *rustici* and *nativi*. Soon the difference became at most one of degree; and serf and villein were used almost indiscriminately for the great group of non-freemen. They were incapable of enjoying anything like a complete right to property, inasmuch as it was held, in accordance with the principles of the Roman law, that whatever the slave acquired belonged to his lord, who might seize it at his pleasure. The master could transfer them to any other master with the land they tilled. They could not even buy their freedom; and they could not educate their sons for the Church without the consent of the lord. If the villein ran away he could be pursued and carried back. But if his lord maltreated him he might have remedy in the king's court; and the law defended him fully against injury from strangers. His oath was accepted as evidence. He was often kindly used by his lord, and generally allowed to lay by his savings. He was free from military service and had a powerful friend in the Church. It used to be said that as distinguished from these *villeins regardant* there were also a distinctly lower class of *villeins in gross* who had no political rights and might be sold away from the land as absolute chattels of the lords; but this is now denied on good evidence. By a peculiarity in the usages of Great Britain the condition of a child as regards freedom or servitude followed the father, and not the mother, and therefore the bastards of female villeins might be free.

The abolition of serfdom in Western Europe was a very gradual process, various causes having combined to bring it about. The Church did not as such denounce the practice of keeping Christians in bondage; indeed, churches and monasteries were among the largest proprietors of serfs. But churchmen insisted on humane treatment and practised manumission to a large extent. In the course of time usage greatly modified the rights and liabilities of the serf, whose position must have been considerably altered when we find him making stipulations regarding the amount of his services and purchasing his own redemption. The towns afforded in more than one way a means of emancipation. A serf residing a year in a borough without challenge on the part of his lord became *ipso facto* a free man. The serf's condition improved gradually but steadily, till he had all the rights of a citizen save against his lord, who required from him the customary services in cultivating the lord's lands; and his hold on his land became a kind of definite tenure of villeinage. The "black death" checked the progress, but only for a time. But the serf's position became by custom more secure and more independent. Serfdom died out in England without any special enactment; yet it was not wholly extinct in the later half of the 16th century, for we find a commission issued in 1574 by Queen Elizabeth to inquire into the lands and goods of all her bondsmen and bondswomen in the counties of Cornwall, Devon, Somerset, and Gloucester, in order to compound with them for their manumission, that they might enjoy all their lands and goods as freedmen. In a few rare instances liability to servile duties and payments in respect of lands seem to have continued down to the reign of Charles I. In Scotland as in England serfdom disappeared by insensible degrees; but a remarkable form of it continued to survive down to the closing years of the 18th century. Colliers and salters were bound by the law, independent of paction, on entering to a coal work or salt mine, to perpetual service there; and in case of sale or alienation of the ground on which the works were situated, the right to their services passed without any express grant to the purchaser. The sons of the collier and salter could follow no occupation but that of their father, and were not at liberty to seek for employment anywhere else than in the mines to which they had been attached by birth.

In France, though a general edict of Louis X., in 1315, purported to enfranchise the serfs on the royal domain on payment of a composition, this measure seems never to have been carried into effect, and a limited sort of villeinage continued to exist in some places down to the Revolution. In Italy one great cause of the decline of villeinage was the necessity under which the cities and petty states found themselves of employing the peasant population for their

Slavery

defense, whom it became expedient to reward with enfranchisement. In the 11th and 12th centuries the number of serfs began to decrease, and villeinage seems no longer to have had an existence in Italy in the 15th century. Joseph II. abolished serfdom in Bohemia and Moravia in 1781, and in the German lands in 1782. Over a large portion of Germany the mass of the peasants had acquired their freedom before the end of the 13th century, but in some parts of the Prussian dominions a modified villeinage continued to exist till swept away by the reforms of Von Stein in the 19th century.

Negro Slavery.— This form existed from the earliest times; the Carthaginians seem to have brought caravans of slaves from various parts of North Africa; but in this the negroes suffered no more than other contemporary barbarians. The negro slavery of modern times was a sequel to the discovery of America. Prior, however, to that event the negroes, like other savage races, enslaved those captives in war whom they did not put to death, and a considerable trade in slaves from the coast of Guinea was carried on by the Arabs. The deportation of the Africans to the plantations and mines of the New World doubtless raised the value of the captive negro, and made slavery rather than death his common fate; while it may also have tempted the petty princes to make war on each other for the purpose of acquiring captives and selling them. The aborigines of America having proved too weak for the work required of them, the Portuguese, who possessed a large part of the African coast, began the importation of negroes, in which they were followed by the other colonizers of the New World.

The first part of the New World in which negroes were extensively used was Haiti, in St. Domingo. The aboriginal population had at first been employed in the mines; but this sort of labor was found so fatal to their constitution that Las Casas, Bishop of Chiapa, the celebrated protector of the Indians, interceded with Charles for the substitution of African slaves as a stronger race. As early as the beginning of the 16th century a good many Africans were already in Hispaniola; the emperor accordingly in 1517 authorized a large importation of negroes from the establishments of the Portuguese on the coast of Guinea. Sir John Hawkins was the first Englishman who engaged in the traffic, in which his countrymen soon largely participated, England having exported no fewer than 300,000 slaves from Africa between the years 1680 and 1700; and between 1700 and 1786 imported 610,000 into Jamaica alone. At first the trade was in the hands of special companies, one of which long enjoyed the special right or "assiento" from Spain of supplying slaves. Most of the English slaving ships belonged first to Bristol, and from 1730 onward to Liverpool.

The slave trade was attended with extreme inhumanity; the ships which transported the negroes from Africa to America were overcrowded to such an extent that a large proportion died in the passage; and the treatment of the slave after his arrival in the New World depended much on the character of his master. Legal restraints were, however, imposed in the various European settlements to protect the slaves from injury; in the British colonies courts were instituted to hear their complaints; their condition was to a certain extent ameliorated, and the flogging of women was prohibited. But while slavery was thus legalized in the British colonies, it was at the same time the law of England (as decided in 1772 by Lord Mansfield in the case of the negro Somerset, and less emphatically by other judges at earlier dates, without any actual statute on the subject) that as soon as a slave set his foot on English soil he became free; though, if he returned to his master's country, he could be reclaimed. Up till this date the contrary impression was the usual one, though public opinion was strongly setting against the custom of keeping slaves. In 1764 there were believed to be thousands of negro slaves in London; and advertisements of "black boys" for sale were frequent, as also rewards offered for runaways. As late as November, 1771, the Birmingham "Gazette" advertised the public sale of a negro boy, sound, healthy, and of a mild disposition.

Before the idea of emancipation was contemplated the efforts of the more humane portion of the public were directed toward the abolition of the traffic in slaves, mainly under the influence of a sense of Christian duty. In 1787 a society for the suppression of the slave trade was formed in London, numbering Thomas Clarkson and Granville Sharp among its original members. The most active parliamentary leader in the cause was William Wilberforce, and Zachary Macaulay was one of its most zealous friends. The Quakers were the only religious body who as such petitioned the House of Commons on the subject. Many not unkindly people defended slavery. Thus Boswell, who on this point opposed his master, speaking of "so very important and necessary a branch of commercial interest," says: "To abolish a status which in all ages God has sanctioned and man has continued would not only be robbery to an innumerable class of our fellow subjects, but it would be extreme cruelty to the African savages, a portion of whom it saves from massacre and introduces to a much happier life."

In 1788 an order of the crown directed that an inquiry should be made by a committee of the privy council into the state of

Slavery

the slave trade; and an act was passed to regulate the burden of slave ships and otherwise diminish the horrors of the middle passage. A bill introduced by Wilberforce for putting an end to the further importation of slaves was lost in 1791, but in 1792 Wilberforce, supported by Pitt, carried a motion to gradually abolish the slave trade. And it is noteworthy that the anti-Christian French convention, influenced by the teaching of Rousseau, decreed, Feb. 4, 1794, that slavery should be abolished throughout the French colonies, and all slaves admitted to the rights of French citizens. Meanwhile, conquest of the French colonies having led to a great increase in the British slave trade, an order in council in 1805 prohibited that traffic in the conquered colonies; and in the following year an act was passed forbidding British subjects to take part in it for the supply either of the conquered colonies or of foreign possessions. In the same year a resolution moved by Fox for a total abolition bill, making all slave trade illegal after Jan. 1, 1808, was introduced by Lord Howick, afterward Earl Grey, in the House of Commons, was carried in both Houses, and received the royal assent on March 25, 1807. British subjects, however, continued to carry on the trade under cover of the Spanish and Portuguese flags; the slave ships were more crowded than ever, to reduce the chances of capture, and the negroes were not infrequently thrown overboard on a pursuit. The pecuniary penalties of the act were discovered to be inadequate to put down a traffic so lucrative as to cover all losses by capture. Brougham, therefore, in 1811, introduced a bill, which was carried unanimously, making the slave trade felony, punishable with 14 years' transportation, or from three to five years' imprisonment with hard labor. An act of 1824 declared it piracy, and, as such, a capital crime, if committed within the Admiralty jurisdiction; and the statute of 1837, mitigating the criminal code, left it punishable with transportation for life. The Anti-Slavery Society practically established the colony of Sierra Leone in 1787 as a home for destitute negroes.

The United States abolished the slave trade immediately after Great Britain (1808), and the same was in the course of time done by the South American republics of Venezuela, Chile and Buenos Ayres, by Sweden, Denmark, Holland, and, during the Hundred Days after Napoleon's return from Elba, by France. Great Britain, at the peace, exerted her influence to induce other foreign powers to adopt a similar policy; and eventually nearly all the states of Europe have passed laws or entered into treaties prohibiting the traffic. The accession of Portugal and Spain to the principle of abolition was obtained by treaties of date 1815 and 1817; and by a convention concluded with Brazil in 1826 it was declared piratical for the subjects of that country to be engaged in the slave trade after 1830. By the conventions with France of 1831 and 1833, to which nearly all the maritime powers of Europe have since acceded, a mutual right of search was stipulated within certain seas, for the purpose of suppressing this traffic. The provisions of these treaties were further extended in 1841 by the Quintuple Treaty between the five great European powers, subsequently ratified by all of them except France. The Ashburton treaty of 1842 with the United States provided for the maintenance by each country of a squadron on the African coast; and in 1845 a joint coöperation of the naval forces of England and France was substituted for the mutual right of search.

The limitation of the supply of negroes naturally led, among other good results, to a greater attention on the part of the masters to the condition of their slaves. But the attention of British philanthropists was next directed toward doing away with slavery altogether in the colonies. Societies were formed with this end, an agitation was set on foot, and attempts were made, for some time without success, to press the subject of emancipation on the House of Commons. At length in 1833 a ministerial proposition for emancipation was introduced by Mr. Stanley (Earl of Derby), then Colonial Secretary, and an emancipation bill passed both Houses, and obtained the royal assent Aug. 28, 1833. This act, while it gave freedom to the slaves throughout all the British colonies, at the same time awarded an indemnification to the slave owners of $100,000,000. Slavery was to cease on Aug. 1, 1834; but the slaves were for a certain duration of time to be apprenticed laborers to their former owners. Objections being raised to the apprenticeship, its duration was shortened, and the complete enfranchisement took place in 1838. The serious decadence of trade and commerce in the British West Indies has been commonly attributed to emancipation; but though the change in the position of the negroes unquestionably contributed to the result, it is clear that before a slave had been manumitted by law the industry of Jamaica and the other islands had already begun to fall off.

The French emancipated their negroes in 1848; as did most of the new republics of South America at the time of their establishment; while the Dutch slaves had freedom conferred on them in 1863. In Haiti slavery ceased as far back as 1791, its abolition having been one of the results of the negro insurrection of that year. In

Brazil slavery was not abolished till 1888.

The steps that hindered or prepared the way for the final abolition of slavery in the United States in 1861–1865 are part of the history of the country. Here it may be noted that in 1800 there were in the United States 893,041 slaves; that Vermont, Pennsylvania, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey emancipated their slaves before 1840, most of them by gradual measures. The average value of slaves was about this period stated at $600. The 3,953,760 slaves at the census of 1860 were in what were known as the Southern States. Eminent leaders of public opinion from the earliest period of the national existence — such as Washington, Franklin, Jefferson, Madison, Jay, Hamilton — regarded slavery as a great evil and inconsistent with the principles of the Declaration of Independence. The Society of Friends uniformly opposed slavery and agitated against it. The Presbyterian Church made six formal declarations against it between 1787 and 1836.

The Methodist Episcopal Church always cherished strong anti-slavery views; though when in 1844 one of their bishops was suspended for refusing to emancipate slaves he had inherited through his wife, a secession took place, and the Southern Methodist Episcopal Church was formed. Individuals and groups of persons of almost all churches were found defending slavery. In 1835 the Charleston Baptist Association resolved that the right of masters to dispose of their slaves had been distinctly recognized by the Creator. In 1836 a North Carolina bishop strongly commended for publication a sermon which declared that without a new revelation from heaven no man was authorized to pronounce slavery wrong. In 1838 the New School Presbyterian Church in Petersburg, Virginia, protested against a resolution of the General Assembly declaring slavery a sin against God, pronounced that resolution irreconcilable with American civil institutions, and affirmed that the relation of master and slave had been recognized by the great Head of the Church. Yet, on the whole, anti-slavery views grew steadily; but till the crisis of the Civil War very many of those who personally held strong anti-slavery opinions hesitated to join actively in abolitionist agitation, as unwilling to invade what many of their fellow citizens held to be their indisputable rights. To this halting attitude the war put an end.

Mohammedanism recognizes the institution; Mohammed's own precepts insist on the kindly usage of the slave; and Moslem slavery is mainly domestic slavery, household slaves being on the whole well treated. But there is no more awful chapter in the history of human callousness and human misery than the story of the slave trade as carried on by "Arab" or Moslem slave traders, its main tracks from the interior of Africa to the coast being still in many places marked by the whitened bones of slaves who during the ages have sunk in the way, fallen out of the caravans in spite of the lash, and have died or been slaughtered to save trouble. The main regions from which slaves were procured for the Moslem East were, or still are, the Sudan proper, the Egyptian Sudan, or Valley of the Upper Nile, Somaliland, and the borders of the Portuguese East African territory. English and other men-of-war have long been employed in capturing slave dhows on the E. coast. In 1869 the Egyptian Khedive Ismail gave Sir Samuel Baker large powers for the suppression of the slave trade, a crusade carried on by Gordon Pasha. The Sultan of Zanzibar signed a treaty for the suppression of the trade in 1873.

By occupying Caucasia, Russia stopped an important supply for the Turkish harems; it also closed the slave markets of Khiva and Bokhara, and by crushing the Turkomans (Tekkes and others) freed at once 40,000 slaves. Cardinal Lavigerie, who became Archbishop of Algiers in 1867, made the suppression of the slave trade and slavery his life work, and secured the help of many zealous fellow workers, men and women. The progress of the Kongo Free State, the foundation of missions in the Nyassa country, and the encouragement of legitimate trade by the British East Africa Company and the German settlements will, it is hoped, tend still more effectually to put an end to this curse of mankind. It has been said that the African slave trade will not finally cease till the African elephant is extinct, as the carrying of ivory to the coast has heretofore only been practicable by slave labor. Conferences of the civilized powers have repeatedly been held with a view to the further restriction of domestic slavery (the entire suppression of which at once is hopeless) and the total prevention of the slave trade.

Slavic Nations, a group that forms a large and important branch of the Aryan family, numbering about 80,000,000, and occupying nearly a third of Europe. Of their history prior to the 6th century of our era little is known with certainty. Their ancestors, together with those of the Letts and Lithuanians, are supposed on linguistic evidence to have been once united within a Letto-Slavic group; but the separation of the Lettic from the Slavic family must have taken place at a very remote period. No evidence exists even in tradition as to the time at which the Slavs entered Europe, but their wave of immigration appears to have been later

Slavic Nations

than the Celtic, Græco-Italic, and Teutonic waves. The E. shores of the Baltic, in the neighborhood of which are still found the dwindling remains of the Lettic races, are claimed as the early homes of some Slavic tribes, while others are supposed to have long dwelt near the N. shores of the Black Sea, or roamed over the vast tract vaguely designated as Sarmatia, stretching from the Caspian toward the mouth of the Vistula. From the 5th century B. C. they are supposed to have existed in Europe for nearly 1,000 years without materially affecting its history, at first confused in the opinion of the ancients with Scythians and other unfamiliar races, afterward more clearly distinguished by Greek and Roman writers as Venedi or Veneti (a name suggestive of the German Wenden). At length a S. movement seems to have brought them into contact with the Roman empire, and in the 6th century of our era they appear in the works of the historians Jornandes and Procopius as Sclavini or Sclabenoi; names from which comes the superfluous c in the word "Sclavonic." The origin of the name Slav is uncertain. It has been derived from *slava*, glory, and from *slovo*, a word; the latter derivation being supported by the fact that the Slavs termed foreigners *nyemtsy*, dumb, *i. e.*, "wordless." The name Serb or Servian is also of doubtful origin. Attempts have been made by hostile critics to connect it with the Latin *servus*, but they involve a false etymology. The words "slave" and "Slav" are undoubtedly connected, but only because so many Slavs were in the course of time reduced to servitude did their name become a synonym for a thrall. Ranked at first among the barbaric foes of the Empire, the S. and W. Slavs gradually became civilized, entered into alliances with the emperors, accepted Christianity, and founded principalities which for a considerable time flourished prosperously. Bohemia, Moravia, Servia, and Bulgaria were all important Slav states which long maintained their independence. Poland was another, and it held its own till modern times. The N. Slavs were not all equally fortunate, many of their tribes being gradually driven out or absorbed without ever attaining political importance. But in the N. E. a combination of Scandinavian rulers and Slav subjects laid the foundations of the power which eventually developed into the Russian empire.

Polity, Religion, Culture, etc.— There never seems to have been any political cohesion between the various Slavic nations. The idea of Panslavism, of Slavonic unity, is a modern creation due principally to a religious sentiment. In ancient times each tribe of Slavs appears to have been independent of the rest, itself divided into a number of self-governing clusters of family communities. Each of these clusters was among the W. Slavs called a *jupa*, and had at its head a ruler who bore the title of *jupan*. In the center of the *jupa* was the *grad* or town, in which business was transacted and religious rites were performed. Each head of a family community was supreme within its limits, ruling his household with patriarchal power, and, at least among the eastern tribes, being priest as well as judge. Agriculture was everywhere the main pursuit of the Slavs, who are therefore supposed to have been of a peaceable nature, though they fought bravely when attacked, surrounding themselves with a rampart of linked cars.

Of their religion in general not much is known. Accounts have been preserved of the temples and rites of some of their tribes, especially the Baltic Slavs, on whom, however, much influence seems to have been exercised by Lithuanians and Scandinavians. But with respect to the religious ideas of the great majority scarcely any direct evidence can be cited. Allusions to the ancient gods are found in the popular songs which exist in such numbers among all Slav races, but no compiler of a Slav Edda has ever arisen. A collection of Bulgarian popular poems was commenced in 1874, under the title of "Le Veda Slave," which professed to throw much light on Slav mythology, but it has not been accepted as a trustworthy guide. Like the other Aryan races, the ancient Slavs appear to have based their religion on the reverence they paid to the forces of nature and to the spirits of the dead. The chief deity worshiped by at least the E. and S. tribes was the thunder god Perun, the Perkunas of Lithuania, whom mythologists are inclined to identify with Vedic Parjanya. With him were linked in honor a pastoral divinity named Volos, a Dazhbog or "Day-god," "Ogon" or Fire, a being evidently akin to the Vedic Agni, and Svarog, the Slav counterpart of the Vedic Varuna and the Hellenic Ouranos. Along the Baltic special reverence was paid to a Triglaf, a Sviatovit, and other divinities, represented by idols having several faces or heads.

After the introduction of Christianity, the worship of these and similar divinities was long kept up by the different Slav tribes in unfrequented spots, and to this day numerous superstitious ideas and rites point to the once prevalent belief in them, such as the sacrifices employed to avert cattle plagues, and the credence given to stories about Domovoys, Rusalkas, Vilas, and other supernatural inhabitants of fields, forests, hills and streams. To the present day also have survived customs which, though now connected with Christian ceremonies, are really survivals of old rites

performed in heathen times on behalf of the dead. About the language spoken by the ancient Slavs it is possible to speak with more certainty, as records exist which show what was its nature 1,000 years ago. There were, no doubt, many dialects spoken at that time by the various Slavic tribes, but they seem to have long continued to be very closely allied. And therefore the translation of the Scriptures which was made for one set of Slav converts to Christianity might well suffice for another.

When the inhabitants of the extensive principality known as "Great Moravia" accepted Christianity in the 9th century, their first teachers, the Greek monks Cyril and Methodius, translated the Bible for their benefit, inventing for the purpose the alphabet known as the Cyrillic. This translation, written in what is generally called "Old Bulgarian" or "Church Slavonic," still forms the authorized version of the Bible for the whole Slavonic race. It represents the language of their ancestors as it existed in the 9th century, one which is no longer understood anywhere by the common people, but which does not differ much more from that now spoken by some of the Slavic nations — the Russians and Servians for instance — than the English of the 14th century differs from that of the present day. Modern Slavs may be divided linguistically into two branches, the E. and the W. And this division may be used also to distinguish them, though not with the same precision, according to their religious doctrines, for the great mass of the E. Slavs belong to the Greek Church, of the W. Slavs to the Church of Rome. The E. group comprises the Russians, Servians, Bulgarians, and a number of races akin to the Servians. The W. contains the Poles, the Czekhs of Bohemia, Moravia, and Hungary, and the Wends of Lusatia. An educated Slav can generally understand, or at least very quickly learn, the dialect spoken by any member of the branch to which he belongs. But the speech of an E. Slav is generally unintelligible to a W. A Pole will easily communicate with a Czekh, but a Lusatian Wend will find little that is familiar to his ear in Russian or Servian. And the difficulty of communication between the members of the two branches is increased by the difference between the alphabets they use, the E. Slavs employing, as a general rule, a modified form of the Cyrillic, and the W. having adopted the Roman.

Ethnography.— It is not quite so easy to divide and group the existing Slavs. The majority of the "Great Russians" — that is to say, the inhabitants of the greater part of Russia in Europe, the "White Russians" and "Little Russians" being excluded — seem to be descended from Slav settlers among Finnic races, who intermarried with, and forced their language on, the original inhabitants of the lands they colonized. The "Little Russians" of the S. W. provinces appear to be of purer Slav descent, and less akin to the "Great Russians" or "Muscovites" than to the Poles with whom they were so long politically united. Among the speakers of Serb dialects — the Servians, Croatians, Bosnians, Slovenes, Slavonians, Dalmatians, and above all the Montenegrins — the Slav type appears to have been preserved in comparative purity. But they differ among themselves in many respects, especially as regards religion. Of those who are under Austrian rule, the majority belong to the Church of Rome, while the rest are for the most part members of the Greek Church. In Bosnia and Herzegovina many of the inhabitants, though certainly of Slav origin and speaking a Slav tongue, are Mohammedans. But their case is a singular exception to the general rule. For the E. Slavs, in spite of their long subjection to Turks and Tartars, clung to their Christianity with a firmness in striking contrast to the docility with which, at the command of their own princes, their ancestors gave up their heathenism.

To what race the modern Bulgarians belong is uncertain. They speak a Slav language, but one which has been considerably modified. It has lost its infinitive, it has accepted the use of an article, it has borrowed a great number of Turkish words, and it has undergone other changes. Still it retains its original Slavonic character. But the people who speak it appear to be the descendants of a tribe not belonging to the Aryan family, but who settled down among Slavs and adopted their speech. Of the members of the W. branch the Poles seem to have kept nearest to the old Slav type. For the original nature of the Czekhs, owing to the long union of their principalities with German states, has become considerably modified, a large German element having entered into their constitution. Both the Poles and Czekhs belong to the Church of Rome, but the two races differ widely in the degree of their attachment to it. The long antagonism of Poland to Russia has produced an intense devotion on the part of the Poles to the Vatican, the constant foe of the Russo-Greek Church. The national movement among the Czekhs against their Roman Catholic German rulers gave rise in the 15th century to a Protestant feeling which culminated in the teaching of John Huss and Jerome of Prague, and the armed resistance of their adherents, and has of late induced some of their leaders to look favorably on the Eastern Church. The Wends of Lusatia, the last remains of the once numerous and

flourishing races settled along the course of the Elbe, are closely linked by language with the Poles and Czekhs; but they differ from them in religion, the great majority being Protestants. They have become to a great extent peacefully Germanized. Of the once flourishing Slav settlements along the Baltic, from Kiel to Danzig, but few remains are now to be found, though here and there appears among German neighbors some hamlet where Slav customs and a Slav speech are still to be recognized.

Slavonia, or **Sclavonia,** a province of Austro-Hungary, forming, with Croatia, a kingdom united with that of Hungary, bounded N. and E. by Hungary, W. by Croatia, and S. by Turkey; area, of Croatia and Slavonia, 16,773 square miles; pop. (1901) 2,416,304. Pop. about 600,000, belonging to the Illyrio-Servian branch of the Slavs, and chiefly to the Greek Church. Principal towns, Zagreb (the capital), Peterwardin, Carlovitz, Semlin, Mitrovitz, and Brod.

Sledge. See SLEIGH.

Sleep, that natural state or condition of unconsciousness in animals which alternates with a period of activity. In this state the involuntary functions, such as those of nutrition, secretion, etc., go on as usual, but the voluntary powers are quiescent. All action in the living economy produces waste of tissue; and, accordingly, rest is necessary in order that the deficiency may be made up. Hence it is that we feel refreshed after sleep; the muscles possess greater strength, the nerves have attained a higher sensibility, and the powers of the mind are more active. Many hypotheses have been advanced by physiologists to account for the phenomena of sleep, but all more or less unsatisfactory. According to some it arises from mere exhaustion of the sensorial powers, the brain ceasing to act because it is fatigued and cannot act further till restored by rest. In many cases, however, we find excessive fatigue, either of mind or body, to be an effectual preventive of sleep. Others again refer sleep to changes in the cerebral circulation, regarding it as arising from congestion or a retarded movement of the blood in the cerebral vessels, especially the veins, or, according to some, from a diminished flow of arterial blood to the brain. It is not improbable that several of these causes may be at work in producing sleep, the nervous power being enfeebled by its expenditure during the waking state, and the circulation becoming slower, the vessels become, in consequence, congested, and there is a deficient supply of arterial blood, leading to a suspension of the powers of attention and voluntary motion. According to Sir Henry Holland, sleep is not a single state, but "a succession of states in constant variation; their variation consisting not only in the different degrees in which the same sense or faculty is submitted to it, but also in the different proportions in which these several powers are under its influence at the same time." The approach of sleep is announced by diminished activity of mind and loss of the power of attention. The senses become blunted to external impressions, and we feel an unconquerable desire for stillness and repose. Our ideas grow confused, our sensations more obscure, our sight fails us, and, if our ears still perceive sounds, they are indistinct and seem as though distant. The eyelids close, the joints relax, and we instinctively assume an easy position and fall into a sleep. As a general rule the senses and reasoning faculties sleep first, while the imagination and lighter ones remain longest awake. Sleep is at first deep, then soft and gentle, and becomes gradually less sound as the time for waking approaches. There is usually an intermediate state between sleeping and waking, in which the sleep is very light and from which persons can be aroused with the greatest facility. The amount of sleep required by a person varies according to age, temperament, habit, and previous fatigue. The new born infant sleeps almost continuously, and very old persons also require a great deal of sleep. Middle life is the period when the system requires the least sleep; and women usually require less sleep than men. The average amount of sleep required by a healthy person is about eight hours; but it varies greatly in different individuals, some persons being able to sustain nature with only four hours, while some sluggish persons spend nearly half their time in sleep. Not one of the least strange of the phenomena of this state is the power that some persons have of awaking at a particular hour predetermined on.

The sleep of plants is one of the phenomena of irritability in plants. Light acts on plants as a powerful stimulus, essential to their active and healthy vegetation. When it is withdrawn, the flowers of many plants close, and the greater number show a tendency to it, while leaves more or less decidedly incline to fold themselves up. The leaf stalk also generally hangs down more or less, though in some plants it is more erect during sleep. The sleep of plants, however, is not always nocturnal. The flowers of some open and close at particular hours of the day. Thus the crocus is a morning flower and closes soon after midday, while some flowers expand only in the evening or during the night. Their hours of vegetative rest are probably as essential to the health of plants as those of sleep are to animals. It was Linnæus

who first observed the sleep of plants in watching the progress of some plants of lotus, the seeds of which he had sown.

Sleeper, in ship-building, a fore-and-aft floor timber in a ship's bottom. Also a knee-piece connecting the transom and after-timbers, to strengthen the counter. Similar timbers strengthen the bows of whalers. In ordnance, the undermost timbers of a gun or mortar platform, or, generally, of any framework. In carpentry, one of the set of timbers supporting the lower floor of the building. The sleepers, in a wooden frame, rest on the sills. In a brick or stone house they rest on the walls. Also, one of a set of logs or scantlings laid beneath a rough floor, as of a pen, shed, or temporary stable. In railroad building, one of the timbers supporting a railway track. When it is longitudinal with the track it is called a stringer or sill; when it is transverse it is called a sleeper or tie. In weaving, the upper part of the heddle of a draw loom through which the thread passes.

Sleepy Hollow, a narrow valley half a mile N. of Tarrytown, N. Y. At this place Pocantico creek flows into the Hudson river. This beautiful valley was made famous by Washington Irving as the scene of one of his most popular sketches, "The Legend of Sleepy Hollow." The old Dutch Church, and the old mill conspicuous in the "Legend" are still standing, and the quiet and quaint character of the country differs very little from the word pictures given by the author. Irving's grave is in the newer part of the cemetery of the old church.

Sleet, snow or hail which is in a partially melted condition before it reaches the surface of the earth. In some cases sleet may also be produced by the simultaneous precipitation of snow or hail from a superior, and of rain from an inferior, stratum of the atmosphere.

Sleeve, The, the meaning of the French name for the English Channel (*La Manche*), so called from its shape.

Sleidan, or **Sleidanus, Johannes,** a German historian; born in Schleiden near Cologne, Germany, in 1506. His greatest work is "Memoirs of the State of Religion and the Civil Government under the Emperor Charles V." (3 vols. 1555), a history written without partisanship and in graceful literary style; he wrote also a history of "The Four Great Empires, Babylonian, Persian, Greek, and Roman" (1556). He died in Strasburg, Oct. 31, 1556.

Sleighs, traveling vehicles without wheels, which in some form are in use in all countries where snow lies for any considerable part of the year. Usually they are on runners — either one or two pairs — which are connected by a framework and support the body of the vehicle; but the well-known traveling sledge (*pulka*) of the Laplanders, built in the form of a canoe with sharp bow and square stern, of light materials and covered with reindeer skin, has no runners. In the United States and Canada, where sleighs are brought to great perfection, lightness, and beauty, they take the place of carriages in winter; and there, too, sleds of lighter build, and supporting a light platform or seat, are made for coasting — *i. e.*, sliding down hills. Long sleds for this purpose, sometimes capable of carrying 40 persons, have two pairs of runners with their framework, on which a platform rests (often like a ladder covered with a cushion); the front pair of runners is turned on a pivot by a steersman with the aid of ropes and pulleys. In Canada toboggans are in popular use for coasting (here called tobogganing), and consist of a single length of wood (or two

RUSSIAN SLEIGH.

boards joined together), about ¼ inch thick, curved backward in front, and the curved portion held back by leather thongs. The toboggan has no runners, may accommodate two to eight persons, and is guided by the steersman's foot dragging behind, toe downward. In Russia sleighs are often drawn by a team of three horses.

Slibowitz, an ardent spirit distilled in Bohemia from the fermented juice of plums.

Slichter, Charles Sumner, an American educator; born in St. Paul, Minn., April 16, 1864; was graduated at the Northwestern University in 1885. He was made Professor of Applied Mathematics at the University of Wisconsin in 1892, and commissioner and secretary of the Wisconsin Geological and Natural History Survey in 1900. His publications include: "Advanced Algebra; Parts I–II" (1888); "School Algebra" (1892); "Logarithmic and Trigo-Tables" (1891); "Manual of Four Place Logarithms" (1892); all with C. A. Van Velzer; and "Logarithmic Tables for Rapid Computation" (1901); etc.

Slickensides, the smooth, polished, or striated, and generally glazed surfaces of joints and faults in rocks. They are considered to have been produced by the friction of the two surfaces during the movement

of the rock. The surface of slickenslides is often coated with a deposition of calcite, hæmatite, chalcedony, or other mineral matter, which takes the form of the grooves and striæ, and thus often looks as if it had been striated.

Slidell, John, an American statesman; born in New York city, about 1793; was graduated at Columbia University in 1810; studied law, and in 1819 went to New Orleans, where he soon acquired a large practice. He was appointed United States district attorney for Louisiana in 1834; elected to Congress in 1843; made minister to Mexico in 1845; and was in the United States Senate in 1853–1861. In September, 1861, he was appointed a Confederate commissioner to France, and in November set out with his associate, James M. Mason, for Southampton. Both commissioners were seized on the English mail steamer "Trent" by Capt. Charles Wilkes of the United States steamer "San Jacinto," and brought to the United States. After imprisonment in Fort Warren he was released on the demand of Great Britain, and sailed for England in January, 1862. From England he at once went to Paris, where in February, 1862, he paid his first visit to the French minister of Foreign Affairs. His mission, which had for its object the recognition of the Confederate States by France was a failure, but he succeeded in negotiating a large loan and in securing the ship "Stonewall" for the Confederate government. After the war he settled in London, England, where he died July 29, 1871.

Slide Rest, in machinery, a tool rest employed for lathes, planing machines, etc., in which the tool is securely clamped to a plate capable of motion in one or several directions by means of screws.

Slide Rule. See GUNTER'S SCALE.

Slide Valve, in steam engineering, a valve which opens or closes by sliding over the port or ports, as the ordinary steam valve of a steam engine.

Slider Pump, a name common to several pumps of various forms, but all having a piston which revolves continuously and forces the water through a pipe by means of a slide regulated by a spring, which intercepts its passage in any other direction.

Sliding Keel. See CENTERBOARD.

Sliding Scale, a scale of payments varying under certain conditions, as: (1) A scale for raising or lowering imposts in proportion to the fall or rise in the price of the goods. (2) A scale of prices for manufactured goods, which is regulated by the rise and fall in the price of the raw material. (3) A scale of wages which rises and falls in proportion to the rise or fall in the market value of the goods turned out. The name was given to two methods adopted in England for raising the duty on imported wheat and other cereals when they became cheap, and lowering it when they became dear.

Sling, a short leather strap having a string secured to each end, by which a stone is hurled. The stone lying in the strap, which has a central aperture to receive it, the sling is rapidly whirled, the ends of the two strings being held in the hand, and when one string is released, the stone flies off at a tangent. The velocity of the projectile is computed from the length of the radius and rate of revolution. The skill

ANCIENT SLING AND SLINGER.

of the left-handed Benjamites in using a sling is mentioned in Judges xx. 16. A sling was the weapon which David used with fatal effect against Goliath. In ancient times the best slingers were believed to be the natives of the Balearic isles.

In machinery, a device for holding articles securely while being hoisted or lowered. It is usually of rope, but frequently a chain having hooks at its ends, and a ring through which to pass the hook of the hoisting rope is employed. For embarking or disembarking horses or cattle, the slings have a canvas band which forms a cradle for the animal. Nautically, the chain, clamp, or rope which supports a yard. To sling the yards for action is to secure them at the slings by iron chains fitted for the purpose. In surgery, a looped bandage or handkerchief placed around the neck to support a wound-

ed arm; as, to carry one's arm in a sling. Nautically, boat slings, strong ropes furnished with hooks and iron thimbles, whereby to hook the tackles in order to hoist the boats in and out of the ship.

Sling Cart, in ordnance, a two-wheeled vehicle used for transporting cannon, etc., short distances. It has a strong, upwardly curved iron axle, through which passes a perpendicular elevating screw. The breech of the gun is slung beneath the axle, and the muzzle beneath the pole, and it is raised from the ground by turning the screw.

Slip, in bookbinding, the end of the twine to which the sheets are sewed, serving to attach the book to the boards. In cricket, one of the two fielders who stand behind and on the off side of the wicket. Short-slip stands close up to the wicket, and is backed up by long-slip. In geology, the slipping of the strata downward on one side of a fault or dislocation, or the appearance presented by the strata which have done so. In hydraulic engineering, an inclined plane on which a vessel in its cradle is supported while on the stocks building, or upon which it is hauled for repair; also, a contrivance for hauling vessels out of the water for repairs, etc. It generally consists of a carriage or cradle with thick wheels, which run on rails laid on an inclined plane. In insurance, a note of the contract made out before the policy is effected, for the purpose of asking the consent of underwriters to the proposed policy. It is merely a jotting or short memorandum of the terms, to which the underwriters subscribe their initials, with the sums for which they are willing to engage. It has no force as a contract of insurance.

In nautical language, the difference between the speed of the propeller and that of the vessel, due to the retreat of the resisting body under the impact of the propeller. Negative slip is when the speed of the vessel is apparently greater than that of the propeller. This occurs when, owing to the bad lines of the vessel, a body of dead water is created, which follows in her wake. In pottery, fluid material for making porcelain. It consists of finely ground flint or of clay. The flint is calcined, stamped and ground in water. Clay is mixed with water, and mechanically divided till it makes a creamy fluid. Also the colored clays used to fill up the depressed pattern in the face of a tile which is to be ornamented by encaustic. In printing, matter in column printed from the galley on slips of paper for revision, when the corrections are likely to be extensive and to affect the paging. In shipbuilding, a place having a slope to a harbor or a river, at a proper angle, for the launch from it of a ship; a building slip. In theatrical parlance (plural), that part of a theater from which the scenery is slipped on; also that part where the actors stand before entering on the scene.

Slipper Animalcule. See PARAMECIUM.

Slips, Propagation by, a mode of propagating plants, which consists in separating a young branch from the parent stock and planting it in the ground. Slips from trees of which the wood is white and light, such as willow, poplar, or lime, succeed best. A slip succeeds more certainly when two or three young buds are left on the lower part of it under ground.

Sloane, Sir Hans, an English naturalist, and founder of the British Museum; born in Killyleagh, Ireland, April 16, 1660; studied medicine in London, Paris, and Montpellier. In 1684 he settled in London in the practice of his profession, and in 1685 was admitted a fellow of the Royal Society, of which he was appointed secretary in 1693, and president in 1727. His "Natural History of Jamaica" (1707–1725) was the result of his observations in that island during a visit in 1687–1689. George I. created him a baronet and physician general to the forces in 1716, and on the accession of George II. he was named physician in ordinary to his majesty. He died in London, Jan. 11, 1752.

Sloane, Rush Richard, an American abolitionist; born in Sandusky, O. He was twice elected probate judge; delegate to the Pittsburg convention which organized the Republican party; for several years a member of the Republican State Committee of Ohio; chairman of the Ohio Republican State Central Committee in 1865–1866; elected mayor of Sandusky in 1878; and prominent in Democratic politics after 1872. He became conspicuous in the abolition movement; and for defending five slaves who had escaped from bondage was arrested under the second Fugitive Slave Act in 1852, being the only person prosecuted under that law.

Sloane, Thomas O'Conor, an American scientist; born in New York, Nov. 24, 1851; was graduated at St. Francis Xavier's College, New York city, in 1869; and soon afterward became Professor of Natural Sciences in Seton Hall College, South Orange, N. J. He was the inventor of a self-recording photometer, the first instrument that ever recorded mechanically the illuminating power of gas; described a new process of determining sulphur in illuminating gas; and was successively the editor of the "Plumber and Sanitary Engineer," the "Scientific American," and the "Youth's Companion." Among his books may be mentioned: "Home Experiments in Science"; 'Electricity Simplified"; "Liquid Air and the Liquification of Gases"; "Facts Worth Knowing"; etc.

Sloane, William Milligan, an American historian; born in Richmond, O., Nov. 12, 1850; was graduated at Columbia in 1868; studied in Berlin and Leipsic (1872–1876), and during part of that time was private secretary of George Bancroft, then minister at Berlin. He was for several years a professor at Princeton, later Professor of History at Columbia. He published: "The French War and the Revolution"; "Life of James McCosh"; in 1897 brought out a very important "Life of Napoleon," in four volumes.

Sloanea (named after Sir Hans Sloane, 1660–1753, president of the Royal Society, whose natural history collection, sold to the nation, became the nucleus of those in the British Museum), the typical genus of *Sloanidæ*. Leaves feather-veined; flowers axillary, in racemes, panicles, or clusters, white or greenish-yellow; species more than 30; fruit from the size of a hazel-nut to that of an orange, bristly, four-celled, four-seeded. Tropical American trees, often above 100 feet high, with very hard wood. *S. jamaicensis* is the breakax or ironwood. The fruit of *S. dentata* is eaten, and the inner bark of the tree, which is astringent, is given in dysentery.

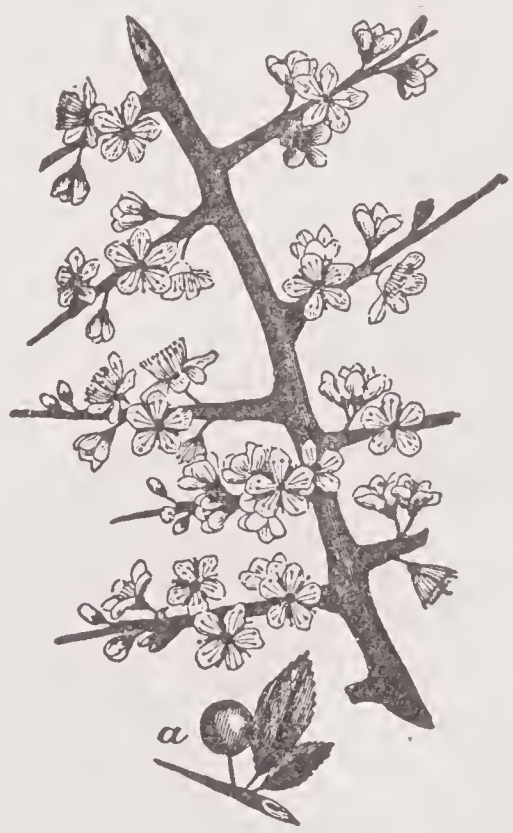
Sloanite (after the Chevalier Sloane, of Florence), an orthorhombic mineral, occurring in radiated masses in fissures of the *gabbro rosso* of Tuscany; hardness, 4.5; sp. gr., 2.441; luster, pearly; color, white; opaque. Composition: Silica, 42.7; alumina, 34.9; lime, 11.4; water, 11.0 = 100.

Slobodskoi, a town of Russia, province of Viatka; on the Viatka river; 23 miles E. N. E. of the town of that name. It has 12 churches, manufactures soap and leather, and trades in corn.

Slocum, Henry Warner, an American military officer; born in Delphi, Onondaga co., N. Y., Sept. 24, 1827. He was graduated at the United States Military Academy in 1852; resigned his commission in 1856; studied law, and practised in Syracuse, N. Y. He was elected a member of the State Legislature in 1859. When the Civil War broke out he was commissioned a colonel of volunteers in the Union army. He was at the first battle of Bull Run, commanding a regiment, July 21, 1861; was promoted Brigadier-General in the autumn of 1861, and commanded a division in the battles of Gaines's Mill, White Oak Swamp, and Malvern Hill. In 1862 he was promoted Major-General; participated in the battles of Bull Run, Aug. 29 and 30; commanded a corps at the battle of Chancellorsville, and at Gettysburg, July 2 and 3, 1863; was placed in command of a corps on the left wing of General Sherman's army; and took part in the great "March to the Sea," leading the left wing of the army from Atlanta to Savannah. In September, 1865, he resigned from the army; settled in Brooklyn; and resumed the practice of law. He was elected to Congress in 1869 and served till 1873. He died in Brooklyn, N. Y., April 14, 1894.

Slocum, Joshua, an American navigator; born in Wilmot township, Annapolis co., Nova Scotia, Feb. 20, 1844; was a sailor from boyhood; studied nautical astronomy and marine architecture; sailed mostly in ships belonging to United States and Great Britain. He built a steamer of 90 tons' register in 1897; and the "Spray" of 9 tons' register, in Fairhaven, Mass., in 1892, in which he made a complete voyage around the world alone in 1898. He was the author of "The Voyages of the 'Liberdade' from Brazil to New York" (1891); "Voyage of the Destroyer" (1894); "Sailing Alone Around the World" (1900); and a contributor to the "Century" and "McClure's" magazines.

Sloe, or **Slo,** in botany, the fruit of *Prunus communis*, variety *spinosa*, or the tree which bears it. The latter has black



SLOE.
a, fruit.

bark, divaricate branches, all spinescent; finely serrulate leaves, convolute when young, at last glabrous beneath; pedicels solitary or in pairs, glabrous; flowers appearing before the leaves; petals obovate, white; berry globose, half an inch in diameter, black, covered with bloom, very austere. Found in hedges, coppices, and woods. Called also blackthorn, and, more rarely, blackthorn may. The leaves of the sloe are often used to adulterate tea.

Slongo, Fort, a Revolutionary fortification built by the Tories, in 1781, on Treadwell Neck, Long Island, N. Y.

Sloop, a fore-and-aft rigged vessel with one mast, like a cutter, but having a jib-stay and standing bowsprit, which the cutter has not. Sloop-of-war, formerly vessels carrying from 10 to 18 guns, but since the introduction of steamships the number of guns has ceased to be distinctive, and the term is now seldom used.

Slosh Wheel, in machinery, a wheel having two slots crossing at right angles and forming guides for two slides which traverse in them like the slides in a trammel. A bar pivoted to the two slides makes two reciprocations in each direction for each revolution of the wheel. The name has reference to the fact that wheels of this description are used in grinding lime.

Slosson, Mrs. Annie (Trumbull), an American author, sister of J. Hammond and Henry Clay Trumbull; born in Hartford, Conn. She devoted much time to the study of entomology and wrote many excellent short stories. Her books include: "Seven Dreamers," a collection of her magazine stories; "The Heresy of Mehetabel Clark"; "Anna Malann"; "The China Hunter's Club"; "Dumb Foxglove"; "Story-tell Lib"; etc.

Sloth, in zoölogy, the popular name for any individual of the Edentate group Tardigrada, from their slow and awkward move-

GIANT SLOTH.

ments on the ground, owing to the peculiar structure of the wrist and ankle joints. The feet are armed with long claws, and turned toward the body, so that the animal is compelled to rest on the side of the hind foot, while the disproportionate length of the fore-limbs causes it to rest also on the elbows. It shuffles forward, alternately stretching the fore legs and hooking the claws into the ground, or grasping some object to draw itself along. Sloths are natives of South America, nocturnal in habit, and are found in the forests of that region, passing their lives among the branches of trees, on the leaves and young shoots of which they feed. In moving from one limb of a tree to another, they hang back downward, embracing the limb with their hind, and drawing themselves forward with their fore feet. They are covered with coarse, shaggy hair, not unlike withered grass, which protects them from insects and shields them from observation when at rest in the daytime. The stomach is complicated, but there is no rumination. The female produces but one at birth, which clings to its mother till able to provide for itself. Their chief enemies are snakes and the carnivora; their arboreal habits are a partial protection against the latter, and against the former they defend themselves by their powerful fore limbs and claws. There are several species.

Sloth Bear, in zoölogy, the *Melursus labiatus*, an Indian bear, found throughout the Peninsula and in Ceylon. It feeds on ants, honey, fruit, and occasionally birds' eggs. It is between five and six feet long, extremely awkward and ungainly in appearance, and the snout and lower lips are prolonged. The fur is mostly black, the muzzle and tips of the feet being of a dirty white or yellowish color, and the breast ornamented with a light crescentic or V-shaped mark.

Slotting Machine, a kind of planing machine employed for cutting slots in metal. A cutting tool descends vertically with a slow motion, pares the metal, and returns with a quick movement. The work rests on a feed table, to which circular and transverse motions are communicated automatically or by hand.

Slovaks, the name of the Slavic inhabitants of North Hungary who in the 9th century formed the nucleus of the great Moravian kingdom, but who, after the bloody battle of Presburg (A. D. 907), were gradually subjugated by the Magyars, to whom even yet they entertain no friendly feeling. Their number is reckoned at 2,750,000, of whom 800,000 belong to the Protestant, and the rest to the Catholic Church. The Slovaks, whose character probably comes nearest to that of the old Slavic type, travel in great numbers over Germany and Poland as peddlers. Their language is a dialect of the Bohemian.

Slovenians, the native name of some Slavonian tribes in Styria, Carinthia, Carniola, and Hungary, numbering about 1,500,000. The language of the Slovenians is closely allied to the Servian. It possesses some very old and valuable monuments of the Slavonic tongue.

Slowacki, Julius, a Polish poet; born in Kremenecz, in Volhynia, Aug. 23, 1809.

In his earlier poems he was under the influence of Byron; but escapes from it in the "Ode to Liberty," "Hymn to the Mother of God," and "Song of the Lithuanian Legion" (1831). The sentiment of Polish nationality finds fullest expression in the dramatic poem "Kordyan" (1834), and the tragedy "Mazeppa." Slowacki reaches the height of his lyric power in the poem "In Switzerland." His last great work, left incomplete, was "King Spirit," which he designed to be a "Legend of the Ages" of Polish history. He died in Paris, April 3, 1849.

Slow Match, a match made so as to burn very slowly. The commonest kind of slow match is a piece of slightly twisted hemp rope dipped in a solution of saltpeter, sugar of lead, etc. Slow matches are chiefly used to fire mines or blasts, the object of using them being to allow the person who fires them to escape to a safe distance before the explosion takes place.

Sloyd, the name given to a certain system of manual instruction which obtains popularity in the schools of Finland and Sweden, and which has been largely adopted in other countries, especially in the United States. The word properly denotes work of an artisan kind practised not as a trade or means of livelihood, but in the intervals of other employment. The fundamental idea of the educational sloyd is to utilize this sloyd work in the schools in a disciplinary way as an integral part of general education. To this end the older children, generally boys, are engaged for a certain number of hours a week in making articles of common household use varying from simple objects such as a flower stick or a pen rest to more complicated articles such as a cabinet or small table. These objects are made from drawings or from models, but to exact measurements, and the utmost accuracy and finish are insisted on. The tools employed are the ordinary tools of the carpenter, with certain exceptions, the most important of which is the knife. It is held that work of this kind is valuable as supplementing and correcting the ordinary school education in the three R's. It fulfills the injunction "to put the whole boy to school," it develops faculties that are not otherwise exercised, it trains the eye, and in particular gives a general dexterity of hand which has a direct economical value, particularly in countries such as Finland and Sweden, where the sparseness of the population does not allow of much subdivision of labor.

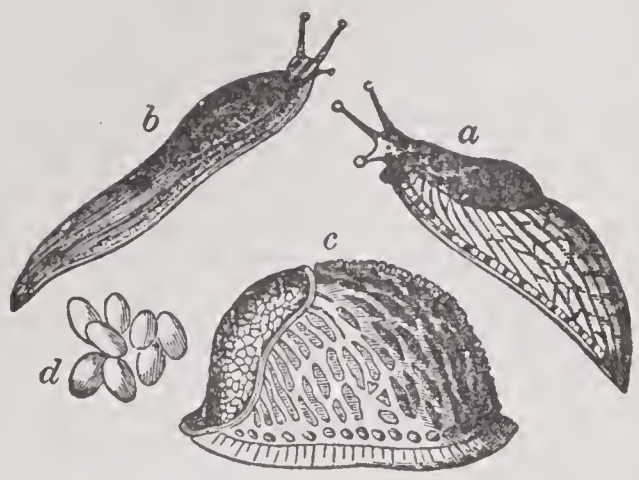
Valuable as are these practical results, the advocates of sloyd maintain that they are only of secondary importance. It is held that in making the models certain educational results, valuable generally, are obtained, which do not follow in like measure on the teaching of the ordinary school subjects, and that, therefore, work of this kind is beneficial for all pupils whatever their future occupation may be. It utilizes, as a means of education, the universal delight of children in making things, and in addition to its special function of training the hand and eye it develops in a prëminent degree habits of self-reliance, order, accuracy, attention, and industry. It tends, like gymnastics, to the increase of physical strength, and it has a desirable effect socially, inasmuch as it fosters a liking for bodily labor and a respect for it. Above all it stimulates and exercises the practical intelligence or power of thought in dealing with things. To obtain these results the educational ends of sloyd must be kept prominently in view. The teacher accordingly ought to be a trained teacher who has acquired the requisite manual skill rather than an artisan, and the work ought to be properly graduated, regard being had to the greater or less difficulty of the exercises with tools involved in making each of the models. Besides wood sloyd, sloyd work in iron and in cardboard (*papp-slöjd*) is also practised. There are also various systems of wood sloyd differing in practical details.

The main principles of sloyd had been advocated by many prominent educationists, and in particular by Herbart and by Froebel, of whose kindergarten system sloyd may be regarded as a continuation. But it was in Finland, on the reorganization of the national system of education by Uno Cygnæus, that manual work was first made a part of the regular instruction in the common schools. In Sweden this branch of education has been systematized and its principles expounded chiefly by Herr Otto Salomon, director of the great slöjd-seminarium at Nääs (instituted 1872), where every year large numbers of students from all parts of the world receive gratuitous instruction.

Slubbing Billy, or **Slubbing Machine,** the first spinning machine for drawing and twisting slightly the cardings or scribblings of wool. It consists of a wooden frame, within which is a moving carriage containing a number of spindles rotated by a series of cords passing round the pulley of each spindle and connected with a drum extending the whole breadth of the carriage. The drum is turned by a crank handle on a shaft connected by a band with the drum.

Slug, in zoölogy, any individual of the family *Limacidæ.* They are naked, air-breathing mollusks, universally distributed, committing great ravages in fields and garden crops in moist weather, but becoming dormant during frosts. The body is generally oval or oblong, elongated, from one to three inches in length, the creeping disk, or sole of the foot, extends the whole length of the animal, but, like snails, slugs frequently raise their heads and move their tentacles in

search of objects above them. They often climb trees, and can lower themselves to the ground by the accumulation of mucus at the extremity of the tail hardening into a gelatinous thread. They oviposit in moist places in spring and summer, often at roots of grass; the eggs resemble small oval clusters of jelly. *Limax agrestis*, the gray slug,



SLUGS.

a, Agriolimax agrestis; b, Arion; c, Arion empiricorum, at rest; d, its eggs.

is the commonest, and *L. maximus* (or *antiquorum*), the great gray slug, among the largest species. *Arion ater*, the black slug, or black snail, and *A. agrestis*, the red slug, are also plentiful. Various means are employed by gardeners to check the ravages of these animals. One of the most efficacious is the sprinkling of coal ashes, lime, or soot round young and tender plants.

Sluice, in hydraulics, a frame of timber, stone, or other solid substance, serving to retain and raise the water of a river or canal, and when necessary, to give it vent. Hence, an opening; a source of supply; that from which anything flows; as, the eyes are the lachrymal sluices of sensibility. The word is also applied to the stream of water issuing through a floodgate. Hence, any stream, or that which is considered as flowing in a stream.

Slur, in knitting, a piece of metal in a stocking frame which depresses the jack sinkers in succession. In music, the smooth blending of two or more notes not on the same degree; also a curved line placed over or under notes, directing that they are to be played legato. A slur is often used in modern music to show the phrasing. In violin music a slur directs that the notes under it are to be played with one bow.

Smack, a small vessel rigged as a cutter, sloop, or yawl, used in the coasting trade and in fishing.

Smalkaldic Articles, articles of guarantee drawn up by Luther at Wittenberg in 1536, and subscribed by the theologians present at a meeting of the League in 1537. It was a summary of the religious principles of the League, designed to be presented to the council proclaimed by Pope Paul III.

Smalkaldic League, a defensive alliance, formed in 1531, between the whole of Northern Germany, Denmark, Saxony, and Würtemburg, with portions of Bavaria and Switzerland, for the defense of the Protestant religion and the political freedom of its adherents against Charles V. and the Catholic powers. The struggle known as the War of Smalkald commenced in 1546, and was carried on with varying fortune on both sides till the objects of the League were attained in 1552, when Maurice, Elector of Saxony, compelled the emperor to grant the treaty of Passau, which was ratified in 1555.

Small Arms, a general name for all portable firearms. See FIREARMS.

Smalley, George Washburn, an American journalist; born in Franklin, Mass., June 2, 1833. During the American Civil War, the war between Prussia and Russia, and the Franco-German War, he distinguished himself as war correspondent of the New York "Tribune," and as representative of the same in London (1867–1895) he gained an eminent rank in journalism. His "London Letters and Some Others" and "Studies of Men" were widely popular. He became American correspondent of the London "Times" in 1895.

Smallpox, an eruptive febrile disease, which happily is not now nearly so prevalent as it once was. It seems very doubtful whether this disease was at all known to the ancients; and, according to some Arabic historians, it came first from Ethiopia into Arabia about A. D. 572. The wars which were carried on in the East, and particularly the Crusades in the 12th and 13th centuries, introduced it into Europe, first into Spain and France, and then into other countries. This disease commonly commences with the usual febrile symptoms; as rigors, pain in the back and loins, great prostration of strength, followed by heat and dryness of the skin, a hard and frequent pulse, loss of appetite, pain in the epigastrium, with nausea, vomiting, headache, and sometimes delirium or convulsions. About the third day an eruption of small, hard, red-colored pimples makes its appearance about the face and neck, and gradually extends over the trunk and extremities. The pimples gradually ripen into pustules, which, on the eighth day, generally begin to break, and crusts or scabs form on these last, falling off in four or five days more. The severity of the disease varies much in different instances, but is almost always in direct relation to the quantity of the eruption. When the pustules are numerous they run together and form an irregular outline; when fewer they are distinct and of a regularly circumscribed circular form. The

former is technically called *variola confluens*, and the other *variola discreta;* the former being never free from danger, the latter seldom or never dangerous.

The most important difference between the two forms is in the secondary fever, which sets in about the eighth day of the eruption, or just when the maturation of the pustules is complete. It is slightly marked in the distinct smallpox, but generally very intense and perilous in most instances of the confluent; being the period at which death oftenest occurs. Both kinds are accompanied by sore throat, salivation, and frequently diarrhœa. A peculiar disagreeable odor also usually proceeds from the body of the patient. Like measles and scarlatina, this disease frequently gives rise to others of a troublesome or dangerous nature; as glandular swellings, abscesses, pleurisy, loss of sight, consumption, etc. Smallpox is the effect of specific contagion communicated by contact or through the air. There is no disease of which the contagion is so sure, and which operates at a greater distance, than that of smallpox; but it rarely attacks the same individual more than once. It is not a little remarkable that a small quantity of the matter taken from a pustule and inserted beneath the skin of a healthy individual gives rise to a much milder form of the disease than would arise in the natural way, *i. e.*, by inhaling the contagious poison; and to this fact are we indebted for the great means of guarding against this disease. (See VACCINATION.) The treatment required in smallpox does not differ particularly from that of ordinary fever; the bowels requiring to be kept moderately open, free ventilation established, and the skin, if necessary, kept cool by sponging it with tepid vinegar and water. Small doses of mercury are often serviceable in moderating the febrile symptoms. The strength requires to be attended to, and, if much reduced, quinine, wine, and nourishing diet are to be employed. The complications of this disease require to be carefully watched, and if the throat be much affected a blister should be applied to the neck, and gargles of infusion of roses used.

Smalls, Robert, an American legislator; born in Beaufort, S. C., April 5, 1839. In early life, being a slave, he was debarred from schooling, but managed to educate himself; served as pilot in the United States navy during the Civil War, and for gallant conduct was made captain in 1863, commanding the gunboat "Planter" till 1866; member of the South Carolina House and Senate 1868–1874; elected to the 44th Congress, and reëlected to all excepting the 46th down to the 51st Congress.

Smalt, in chemistry, a vitreous substance prepared by melting roasted cobalt ore with silica and potash, and grinding the product to a fine powder. It is sometimes called powder blue, and is used to give a blue tinge to writing paper, linen, and starch, and not being affected by fire is frequently employed in painting earthenware.

Smaltine, or **Smaltite,** an isometric metallic mineral, occurring sometimes in crystals in which the cubic faces mostly predominate, but more frequently massive; hardness, 5.5–6; sp. gr., 6.4–7.2; luster, metallic; color, tin-white to steel-gray; streak, grayish-black; brittle. Composition: Somewhat variable owing to the replacement of a part of the cobalt by nickel, but typical kinds would contain, arsenic, 72.1; cobalt, 9.4; nickel, 9.5; iron, 9.0 = 100, corresponding with the formula $(Co,Fe,Ni)As_2$. Dana divides as follows: (1) Cobaltic = smaltine; (2) Nickeliferous = chloanthite, in which cobalt is sometimes almost absent; (3) Ferriferous = safflorite, which contains over 10 per cent. of iron. Mixtures of these lead to other groups, which however blend more or less with one another. Found in veins frequently associated with silver.

Smart, Christopher, an English poet, and one of the interesting figures of literary history; born in Shipbourne, Kent, England, April 11, 1722. His fame rests on a "Song to David" (1763), pronounced by Dante Gabriel Rosetti "the only great accomplished poem of the 18th century." It is said to have been written in a madhouse, "partly with charcoal on the walls, or indented with a key on the panels of his cell," the poet having been deprived of liberty on account of his debts. Noted also is a version of Horace which had a wide sale. Other works are: "Poems" (1752); "Power of the Supreme Being" (1753); "The Hilliah: An Epic Poem" (1753); "Poems on Several Occasions" (1763); "Translation of the Psalms of David" (1765); and many miscellaneous essays, poems, and translations. He died in London, May 21, 1771.

Smart, Sir George Thomas, an English musician; born in London, England, May 10, 1776. By industry and careful study he rose to be composer and organist to the Chapel-Royal, St. James's, and directed the music at the coronation of William IV. and Queen Victoria. He was knighted in 1811. He conducted the principal musical festival, and was the first to introduce Mendelssohn's oratorio "St. Paul" and Rossini's "Stabat Mater." Among his pupils were Madame Sontag and Jenny Lind. He died in London, Feb. 23, 1867.

Smart, Mrs. Helen Hamilton (Gardener), an American novelist; born in Winchester, Va., Jan. 21, 1858. She labored for social and ethical reform and for the development of woman. Among her works are: "An Unofficial Patriot"; "Is This Your Son, My Lord?" "Facts and Fictions of

Life"; "Pray You, Sir, Whose Daughter?" "A Thoughtless Yes." She also wrote magazine articles, part of them collected as "Men, Women, and Gods"; "Historical Sketches of Our Navy"; etc.

Smart, Henry, an English composer (nephew of Sir G. T. Smart, 1776–1867, organist to the Chapel Royal); born in 1813; was educated for the law, but in 1831 became an organist and as such was soon famous. As a composer he possessed a true vein of melody, and a symmetrical and elegant style, his church music (*e. g.*, "Ave Maria") and his part songs (*e. g.*, "Lady, Rise") being his best known works. An opera, "The Gnome of Hartzburg"; a secular cantata, "The Bride of Dunkerron" (1864); and a sacred cantata, "Jacob," were his most ambitious compositions. He died July 6, 1879, not having survived to enjoy a civil list pension of $500 that had been granted to him.

Smart=money, money paid by a person by way of indemnity, to release himself from some embarrassing dilemma, awkward engagement, or humiliating or painful position; hush money. In England, money paid to soldiers or sailors as partial compensation for wounds or injuries received. In law, damages much in excess of full compensation for actual injury done; vindictive damages.

Smeaton, John, an English civil engineer; born in Austhorpe, near Leeds, England, June 8, 1724. He at first followed his father's profession (that of an attorney), but abandoned it for engineering. In 1751 he invented a machine for measuring a ship's way at sea, and also a new form of compass. In 1753 he was elected a fellow of the Royal Society, and was awarded the Copley medal in 1759. In 1755 he was intrusted with the rebuilding of the Eddystone lighthouse, which was completed in October, 1759. It stood till 1882, when it was replaced by a new structure. Smeaton was subsequently employed on many works of great public utility, including the Forth and Clyde canal and Ramsgate harbor. He also perfected Newcomen's steam engine. He died in Austhorpe, Oct. 28, 1792.

Smedley, Francis Edward, an English novelist; born in Marlowe, England, in 1818. Always deformed, he took early to writing, his half-dozen works including: "Frank Fairleigh" (1850); "Lewis Arundel" (1852), and "Harry Coverdale's Courtship" (1854). Bright, cheery books, these appeared originally in "Sharpe's Magazine," of which Smedley for a time was editor, and they were illustrated by Cruikshank and "Phiz." He died in London, May 1, 1864.

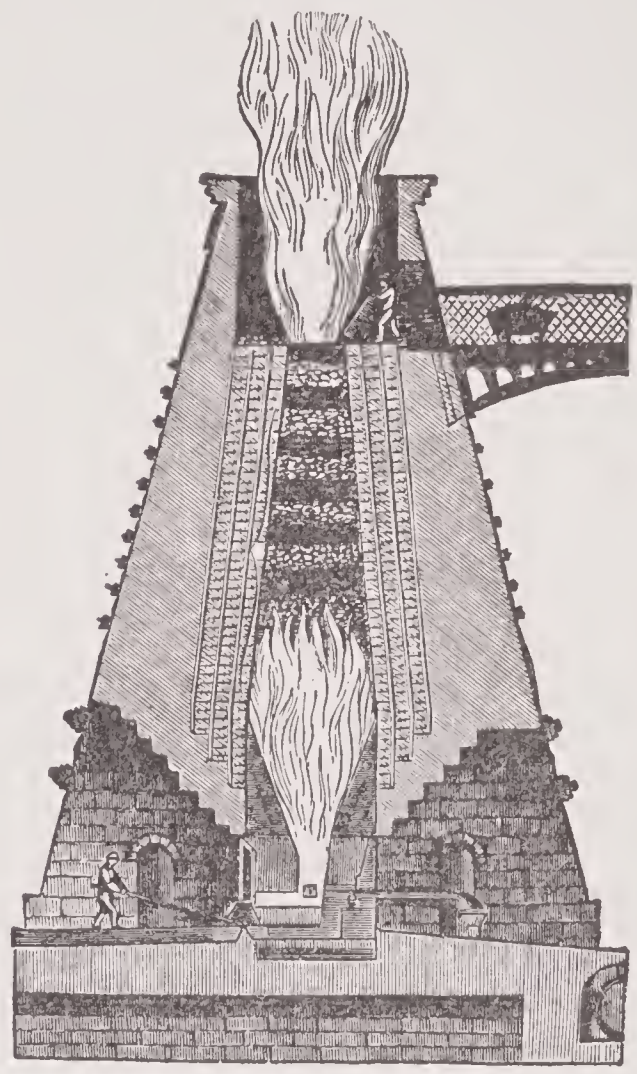
Smell, in physiology, the power or faculty of perceiving odors. For this purpose the animal is provided with a special nerve called the olfactory nerve, in which alone this faculty resides. In man the filaments of this nerve are distributed in minute arrangements in the mucous membrane covering the interior and upper cavities of the nose. The branches are distributed principally in close plexuses, but the mode of termination of the filaments is not yet satisfactorily determined. Besides the sense of smell, the nasal cavities are endowed with common sensibility by the nasal branches of the first and second divisions of the fifth nerve, as is proved by those cases in which the sense of smell is lost, while the party still remains susceptible of sensations of cold, heat, itching, tickling, etc. The olfactory nerve is susceptible of an infinite variety of states, depending on the nature of the external stimulus by which it is brought into a state of activity. All animals do not perceive the same odors in an equal degree. Carnivorous animals, for instance, have the power of detecting by the smell the special peculiarities of animal matters, and of tracking other animals by the scent, but apparently are not sensible to the odors of plants and flowers; while, on the other hand, herbivorous animals are peculiarly sensitive to the latter and have little sensibility to animal odors.

Man is inferior to many animals in respect to acuteness of smell, but his sphere of susceptibility to various odors is more uniform and extended. Odors in the case of animals living in the air arise from substances suspended in a state of extremely fine division in the atmosphere, or gaseous exhalations, often of so subtle a nature that they can be discovered by no other agent than the sense of smell itself. The odorous matters also require to be transmitted in a current through the nostrils, which is effected by the respiratory organs; and hence our perception of them is increased by repeated quick inspirations as in sniffing. They are in all cases dissolved in the mucus of the mucous membrane before they affect the olfactory nerve; and hence this membrane must not be either too moist or too dry. The cause of the difference in the effect of different odors is unknown. Great differences in this respect exist among different individuals, many odors which are generally thought agreeable being to some persons intolerable; and different persons describe differently the sensations which arise from the same odorous substances. Further, the acuteness of this sense differs greatly in different individuals, and there seems to be in some persons insensibility to certain odors, and in the case of sight, to certain colors. Linnæus has divided odors into seven different classes: Aromatic, as the carnation; fragrant, as the lily; ambrosial, as musk; alliaceous, as garlic; fetid, as the rag-wort, valerian; virulent, as Indian pink; nauseous, as the gourd.

Smellie, William, a Scotch naturalist; born in Edinburgh, Scotland, in 1740. In 1765 he commenced business as a printer on his own account, and compiled and conducted the first editions of the "Encyclopædia Britannica," which began to be published in numbers at Edinburgh in 1771, and was completed in three volumes quarto. In 1780 he gave to the world the first part of his translation of Buffon's "Natural History." He wrote a number of treatises on various subjects relating to natural history, which in a collected and emended form were published under the title of the "Philosophy of Natural History"; also memoirs of Lord Kames, Dr. John Gregory, and David Hume. He died in Edinburgh, June 24, 1795.

Smelt, *Osmerus eperlanus;* a small anadromous fish; common on the coasts and in the fresh waters of Northern and Central Europe, and of corresponding American latitudes, from August to May, returning to the sea after it has deposited its eggs. The smelt is one of the most delicate food fishes. It is about seven inches long; scales small, oval, and deciduous; back of a transparent greenish tinge; sides silvery. The lower jaw projects beyond the upper. It sometimes becomes landlocked in lakes. New Zealand smelt, *Retrohinna richarsoni,* one of the *Salmonidæ,* found only in the rivers of New Zealand.

Smelting, the act or process of obtaining metal from ore by the combined action of heat, air, and fluxes. The operation varies according to the different metallic ores to be operated on. In smelting iron the ore is first roasted in a kiln in order to drive off the water, sulphur, and arsenic with which it is more or less combined in its native state, and is then subjected to the heat of a blast-furnace along with certain proportions of coke or coal and limestone, varying according to the quality and composition of the ore to be heated. The smelting of copper consists in alternate roastings and fusions. The first of these operations is calcining the ore in furnaces in which the heat is applied and increased gradually till the temperature is as high as the ore can support without melting or agglutinating, when the ore is thrown into an arch formed under the sole of the furnace. The second operation, or fusion of the calcined ore, is performed in a luted furnace, the ore having been spread uniformly over the hearth, and fluxes, such as lime, sand, or fluorspar, being added when required, though the necessity for this addition is sought to be obviated by a careful admixture of ores of different qualities, the several earthy components of which shall serve as fluxes in the fusion of the mass. These two processes of calcination and fusion are repeated alternately till the ore is completely freed from all the earthy materials, and pure metal is obtained. In smelting lead, the ores, after being sorted, cleansed, ground, and washed, are roasted in furnaces which are without any blast or blowing apparatus, the ores being separable from the metal by its great fusibility. The smelting of tin



HOT BLAST SMELTING FURNACE.

consists of the calcining or roasting of the ores after they had been cleaned, sorted, stamped, and washed. See BLAST FURNACES.

Smelting Furnace, a furnace for disengaging the metal from its gangue or the non-metalliferous portions of the ore. The furnaces differ much, according to the metals to be treated. See BLAST FURNACE: REVERBERATORY FURNACE.

Smew, in ornithology, the *Mergus albellus,* called also the smee or nun, frequenting the seashore and also inland ponds and lakes in Europe and America. The adult male is about 17 inches long; head, chin and neck white, a black patch round the eyes, and over the back of the head is a green streak forming, with some white elongated feathers, a kind of crest; back black, tail gray, wings black and white, under surface white, penciled with gray on the flanks. The female is smaller, with plumage chiefly reddish-brown and gray. The smew is a shy bird; it flies well, but like most divers walks badly, from the backward position of its legs.

Smilaceæ, sarsaparilla; an order of dictyogens. Herbs or under-shrubs often climbing, and with fleshy tuberous rhizomes; leaves reticulated; perianth six-parted; stamens six; style generally trifid; stigmas three; ovary with three cells, each with one or many seeds; fruit, a roundish berry. Known genera, two; species 120, widely distributed, but most numerous in Asia and America.

Smilax, sarsaparilla, the typical genus of the order *Smilaceæ*. The roots of several species or varieties constitute the sarsaparilla of the materia medica. Sarsaparilla is regarded as an alterative in venereal and skin diseases, rheumatism, etc. The kind most valued is that known as Jamaica sarsaparilla, obtained from the species *S. officinalis*. It is not the produce of Jamaica, but of Central America and the N. parts of South America. Other kinds distinguished in commerce are Lima, Lean Vera Cruz, Gouty Vera Cruz, Lisbon, or Brazilian, and Honduras. Among the European species is *S. aspera,* the roots of which form Italian sarsaparilla.

Smiles, Samuel, a British miscellaneous writer; born in Haddington, Scotland, Dec. 23, 1812; was educated at Edinburgh University, and as a surgeon in Edinburgh; editor of Leeds "Times"; secretary of the Leeds and Thirsk railway; afterward of Southeastern railway; then retired. Many of his writings had a very wide circulation. Among them are: "Self-Help" (1860); "Life of George Stephenson" (6th ed. 1864); "Lives of Engineers" (1862; new ed. 1874, 5 vols.); "The Huguenots in England and Ireland" (4th ed. 1876); "Thrift" (1875); "Men of Invention and Industry" (1884); "Life and Labor"; "Conduct"; etc. The King of Servia conferred on him (1897), for his literary work, the Knight Commander's Cross of the Royal Order of St. Sava. He died April 16, 1904.

Smiling Island, The, Ischia, in the Bay of Naples. The soil is very fertile, and the island is one lovely garden.

Sminthinæ, in zoölogy, a sub-family of *Muridæ,* with one genus, *Smithus,* founded for the reception of *S. vagus,* discovered in the Crimea, ranging through Eastern Europe to Tartary and Siberia. One or two other species have since been discriminated: M. $\frac{4}{4}$, the first and fourth much smaller than those between them.

Smirke, Robert, an English painter; born near Carlisle, England, in 1752. He was elected a member of the Royal Academy in 1792. His pictures are generally of small size, and a large proportion of them are illustrations for books, the Scriptures, Shakespeare, English history, Don Quixote, etc., furnishing subjects. He died in London, Jan. 5, 1845. His sons, Sir Robert Smirke (1780–1867), and Sydney Smirke (1799–1877), had considerable reputations as architects.

Smith, Adam, a Scotch political economist; born in Kirkcaldy, Fifeshire, Scotland, June 5, 1723. He studied at Oxford, and was appointed Professor of Moral Philosophy at Glasgow University in 1752. Toward the close of 1763 he accepted an invitation to travel with the Duke of Buccleuch, and having resigned his chair, made a long tour in France, becoming acquainted at Paris with some of the most eminent philosophers and economists. Returning in 1766, he spent the next 10 years in retirement at Kirkcaldy, engaged in the composition of his great work, the "Inquiry into the Nature and Causes of the Wealth of Nations" (1776). It has a high rank among the successful books of the world — overthrowing the grave errors which it attacked, and establishing their opposite truths. Its main principle is that labor, not money or land, is the real source of wealth. The means of making labor most fruitful, the division of labor, what wealth consists in, the mischiefs of legislative interference with industry and commerce, the necessity of freedom of trade, are admirably discussed and expounded. The book may be regarded as the basis of modern political economy. In 1788 Smith settled in Edinburgh, where he had the appointment of a commissioner of customs for Scotland. He was the friend of David Hume, of whose last days and death he wrote an account, with a warm panegyric on his character, which was published with Hume's autobiography. He was also author of a "Theory of Moral Sentiments," which appeared in 1759, and the doctrine of which is that sympathy is the foundation of morals. Smith was chosen lord-rector of the University of Glasgow in 1787. He died in Edinburgh, July 17, 1790.

ADAM SMITH.

Smith, Albert, an English humorist; born in Chertsey, Surrey, England, May 24, 1816. He was a leading contributor to "Punch." He wrote: "The Adventures of Mr. Ledbury"; "Christopher Tadpole"; "Pottleton's Legacy"; a series of "natural histories" of "The Gent," "The Ballet Girl," "The Idler upon Town," "The

Flirt"; and "The Medical Student," a small volume of amusing skits. He died in Fulham, Middlesex, May 23, 1860.

Smith, Alexander, a Scotch poet; born in Kilmarnock, Scotland, Dec. 31, 1830. Among his works, "A Life Drama" (1853) attracted great attention. He wrote: "Sonnets of the War," with Sydney Dobell (1855); "City Poems" (1857); "Edwin of Deira" (1861); also the prose works "Dreamthorpe" (1863), "A Summer in Skye" (1865), "Alfred Hagart's Household" (1866), and "Miss Oona McQuarrie" (1866). He died in Wardie, near Edinburgh, Jan. 5, 1867.

Smith, Andrew Jackson, an American military officer; born in Bucks co., Pa., April 28, 1815; was graduated at the United States Military Academy in 1838, and assigned to frontier duty. At the outbreak of the Civil War he was assigned to the Department of Missouri. Subsequently he was transferred to the Department of the Ohio, and later to the Army of the Tennessee, which he accompanied on the Yazoo river expedition. During the Vicksburg campaign he led a division of the 13th Corps. He was then assigned to the command of a division of the 16th Army Corps which was engaged in the battle of Pleasant Hill and in the reduction and capture of Mobile in 1865. He was mustered out of the volunteer service in January, 1866, and in July became colonel of the 7th United States Cavalry, but resigned in 1869. In April of that year he was appointed postmaster of St. Louis, and on Jan. 22, 1889, was reappointed to the army, and on the same day was placed on the retired list. He died in St. Louis, Mo., Jan. 30, 1897.

Smith, Buckingham, an American historian and philologist; born on Cumberland Island, Ga., Oct. 31, 1810. He was secretary of legation at Mexico (1850–1852), and at Madrid (1855–1858). He made an exhaustive study of Mexican history and antiquities, and published many monographs and historical papers. Among them are: "Narrative of Hernando de Soto" (1854); "Documents Relating to the History of Florida" (1857); "A Grammatical Sketch of the Heve Language" (1861); "Grammar of the Pina Language" (1862). He died in New York, Jan. 5, 1871.

Smith, Charles Emory, an American journalist; born in Mansfield, Conn., Feb. 18, 1824; was graduated at Union College in 1861; edited the Albany "Express" in 1865–1870, and in 1880 became editor of the Philadelphia "Press." He was United States minister to Russia in 1890–1892; a delegate to several National Republican conventions; and postmaster general 1898–1901, when he resumed the editorship of the "Press." He died Jan. 19, 1908.

Smith, Charles Ferguson, an American military officer; born in Philadelphia, Pa., April 24, 1807; was graduated at the United States Military Academy in 1825; appointed instructor in tactics there, and served also as adjutant and commandant in 1829–1842. He was in active service during the Mexican War, commanding a light battalion, and won distinction for bravery at Palo Alto, Resaca de la Palma, Monterey, Churubusco, etc. In 1856 he commanded the Red river expedition; in 1857–1860 served in the Utah expedition. At the outbreak of the Civil War he was appointed a Brigadier-General of volunteers; at the head of a division captured the heights commanding the fort at the battle of Fort Donelson in 1862. In March of the same year was promoted Major-General of volunteers. He died in Savannah, Tenn., April 25, 1862.

Smith, Charles Henry, pseudonym "Bill Arp," an American humorist; born in Lawrenceville, Ga., June 15, 1826; was graduated at Franklin College, Athens, Ga., in 1848; studied law and practised in Rome, Ga., for 27 years, afterward removing to Cartersville; served in the Confederate army in 1861–1865, becoming major on staff of 3d Georgia Brigade. His literary career began (1861) in a series of letters under his pseudonym. His publications include: "Bill Arp's Scrap Book" (1886); "The Farm and the Fireside"; and "Georgia as a Colony and State, 1733–1893." Died 1903.

Smith, Charlotte Turner, an English novelist; born in 1749. She wrote: "Elegiac Sonnets and Other Essays" (1784); "Emmeline; or, The Orphan of the Castle" (1788); "Ethlinde; or, the Recluse of the Lake" (1789); "Celestina: A Novel" (1791); "Desmond: A Novel" (1792); "The Old Manor-House" (1793); "The Emigrants: A Poem" (1793); "Natural History of Birds" (1807). She died in 1806.

Smith, David M., an American inventor; born in Hartland, Vt., in 1809; began the manufacture of "awls on the haft" in 1832; was a member of the New Hampshire Legislature in 1840–1841; patented a combination lock in 1849 and in 1860 began the manufacture of a spring hook and eye for which he also devised the machinery. Subsequently he took out nearly 60 patents, among which was that for the machinery used in folding newspapers. He died in Springfield, Vt., Nov. 10, 1880.

Smith, Edmund Kirby, an American military officer; born in St. Augustine, Fla., May 16, 1824; was graduated at the United States Military Academy in 1845, and appointed a lieutenant of infantry. In the war with Mexico he was twice brevetted for gallantry, and in 1855–1859 served with

distinction in the campaign against hostile Indians. In 1861 he was promoted major, but resigned on the secession of Florida and entered the Confederate army. He took part in the battle of Bull Run; led the advance of General Bragg's army in the Kentucky campaign; defeated the National forces under General Nelson at Richmond in 1862; and in 1863 was assigned to the command of the Trans-Mississippi Department, organized a government of that Territory, introduced machinery, established factories and made powder and castings. In 1864 he defeated General Banks in his Red river campaign. He was president of the Atlantic and Pacific Telegraph Company in 1866–1868; chancellor of the University of Nashville in 1870–1875; and Professor of Mathematics in the University of the South, Sewanee, Tenn., from 1875 till his death there, March 28, 1893.

Smith, Edmund Neale, an English poet; born in 1668. His works are: "Poems on the Death of Mr. John Philips" (1708); "Phædrus and Hippolitus: A Tragedy" (1719); "Monody on Dr. Pocock" (1750); "Odes" (1719). He died in 1710.

Smith, Elizabeth Oakes (Prince), an American writer, wife of Seba Smith; born in Cumberland, Me., Aug. 12, 1806. Among her numerous works are: "Riches Without Wings" (1838); "The Newsboy"; "The Sinless Child, and other Poems" (1841); "Woman and Her Needs" (1847); and "Bald Eagle, the Last of the Rampaughs" (1867). Her children changed their name to Oaksmith to identify themselves with her. She died in 1893.

Smith, Mrs. Erminnie Adelle (Platt), an American ethnologist; born in Marcellus, N. Y., April 26, 1836. When only 16 years old she was graduated from Willard's Troy Seminary. In 1866 she started in Jersey City a class of ladies to study music, literature, and the sciences. They called themselves "Daughters of Æsthetics." In 1880 the managers of the Smithsonian Institution obtained her services to investigate the history, customs, and lore of the Iroquois Indians. Mrs. Smith joined the tribe, and received the name of Ka-tel-tee-sta-Keost, the English of which is "Beautiful Flower." She continued her Indian studies, and at the time of her death was preparing a dictionary of the Iroquois tongue. She wrote many papers on Indian subjects. She was a member of Sorosis, the New York Historical Society, the London Scientific Society, and the Academy of Sciences in New York. She died in Jersey City, N. J., June 9, 1886.

Smith, Francis Hopkinson, an American painter, writer and civil engineer; born in Baltimore, Md., Oct. 23, 1838. He was educated as a mechanical engineer; built the government wall round Governor's Island, one at Tomkinsville, L. I., the Race Rock lighthouse off New London, Conn., the foundation for the statue of Liberty Enlightening the World in New York harbor, etc. He won fame as a water-color artist and an illustrator, and lectured on art. Among his most popular books are: "Old Lines in New Black and White" (1885); "Well-Worn Roads" (1886); "Book of the Tile Club" (1890); "A White Umbrella in Mexico" (1889); "Colonel Carter of Cartersville" (1891); "American Illustrators" (1892); "A Gentleman Vagabond" (1895); "Gondola Days" (1897); "Caleb West" (1898); "The Other Fellow" (1899); etc.

Smith, George, an English Assyriologist; born in London, England, March 26, 1840. The importance of his contributions to our knowledge of Assyrian history and inscriptions is everywhere acknowledged. Part of his published works are: "The Chaldean Account of Genesis"; "Assyria from the Earliest Times till the Fall of Nineveh" (1875); "Assyrian Discoveries" (1875), an account of his own travels and researches; "The Assyrian Eponym Canon" (1876); "History of Babylonia," edited by A. H. Sayce (1877); "History of Sennacherib," edited by A. H. Sayce (1878). He died in Aleppo, Aug. 19, 1876.

Smith, George Otis, an American geologist; born in Hodgdon, Me., Feb. 22, 1871; was graduated at Colby College in 1893; joined a geological survey field party in the Lake Superior region; took a post-graduate course in geology at Johns Hopkins University; joined the United States Geological Survey in 1896; was assistant and full geologist in 1896-1907; then became director of the Survey. Dr. Smith performed a large amount of geological field work, and published numerous reports.

Smith, Gerrit, an American philanthropist; born in Utica, N. Y., March 6, 1797; was graduated at Hamilton College in 1818; studied law; and took up his residence at Peterboro, Madison co., N. Y., devoting himself to the care of a vast landed estate in Central and Northern New York left him by his father. He joined and liberally contributed to the American Colonization Society in 1825, but withdrew from it in 1835, then becoming a member of the Anti-Slavery Society. He gave pecuniary aid to John Brown, in whose affair at Harper's Ferry he, however, it is thought, had no part. He was nominated for governor of New York in 1840 and in 1858; was a member of Congress in 1853–1854, but resigned after one session; with Horace Greeley he signed the bail bond of Jefferson Davis in 1867. He was an earnest advocate of temperance and a supporter of a number

of reforms. He built a non-sectarian church at Peterboro, in which he occasionally preached. He published "Speeches in Congress" (1855); "Sermons and Speeches" (1861); "The Religion of Reason" (1864); "The Theologies" (1866); and "Nature the Base of a Free Theology" (1867). He died in New York city, Dec. 28, 1874.

Smith, Goldwin, an English historian; born in Reading, England, Aug. 13, 1823; was educated at Eton and Oxford, where he graduated first-class in classics in 1845 and became a fellow of University College in 1847. He also held the post of Regius Professor of History in the university from 1858 to 1868. As a lecturer he attracted great attention both on account of his strongly democratic views and his striking originality. Having during the American Civil War strongly defended the cause of the North, he was at the close of the war invited to visit the States to deliver a course of lectures, and his visit resulted in his becoming Professor of History at Cornell University, New York. He resigned the appointment in 1871, and was appointed member of the senate of the University of Toronto, where he afterward resided. Among his chief works are: "Lectures on Modern History" (1861); "The Empire," a series of letters (1863); "Speeches and Letters on the Rebellion" (1865); "Three English Statesmen" (Pym, Cromwell, and Pitt) (1867); "A Short History of England down to the Reformation" (1869); "A History of the United States" (1893); "Essays on Questions of the Day" (1894); "Guesses at the Riddle of Existence" (1896). He died June 7, 1910.

Smith, Green Clay, an American politician, military officer, and clergyman; born in Richmond, Ky., July 2, 1832. He served a year in the Mexican War. In 1862 he entered the volunteer service of the Union army, in which he attained the rank of Brigadier-General; was a member of Congress from Kentucky in 1863–1866; governor of Montana Territory in 1866–1869; later a Baptist minister, mostly an evangelist, but in 1895 accepted the pastorate of the Metropolitan Baptist Church, Washington, D. C. In 1876 he was the Prohibition candidate for the presidency of the United States. He died in Washington, D. C., June 29, 1895.

Smith, Gustavus Woodson, an American military officer; born in Scott co., Ky., Jan. 1, 1822; was graduated at the United States Military Academy and commissioned a brevet 2d lieutenant in the Corps of Engineers in 1842. In September, 1846, he was assigned to duty under General Scott in Mexico, as commander of the corps of sappers and miners, and for his services during that war, especially at Vera Cruz, Cerro Gordo, and Contreras, was brevetted 1st lieutenant and captain. He was assistant Professor of Engineering at the United States Military Academy in 1849–1854; street commissioner of New York city in 1858; a member of the board to revise the course of study at the United States Military Academy in 1860; and on his return to Kentucky in 1861 was commissioned a Major-General in the Confederate army. He was in command at Richmond in 1862; head of the State troops of Georgia in 1864–1865; and after the war engaged in business in Tennessee, Kentucky, and New York. He died in New York city, June 23, 1896.

Smith, Henry John Stephen, an Irish mathematician; born in Dublin, Nov. 2, 1826; was educated at Rugby and Balliol College, Oxford, taking a double-first in 1849. In 1861 he became Savilian Professor of Geometry. He was the greatest authority of his day on the theory of numbers, and also wrote on elliptic functions and modern geometry. In 1881 the French Academy offered their "Grand Prix" for a demonstration of certain theorems, ignorant of the fact that they had already been demonstrated 14 years before by Smith, to whom accordingly the prize of 3,000 francs ($600) was awarded, but not till a month after his death. He was a man of great versatility, geniality, soundness of judgment, and delicacy of humor. He died Feb. 3, 1883.

Smith, Henry Preserved, an American educator; born in Troy, O., Oct. 23, 1847; was graduated at Amherst College in 1869; studied in the Lane Theological Seminary, Cincinnati, O., in Berlin and in Leipsic, was ordained in the Presbyterian Church in 1864; and in 1877 accepted a professorship in the Lane Theological Seminary. He came into special prominence in 1892 when he was accused of heresy and tried by the Cincinnati Presbytery. In 1893, pending the review of his case by the Synod and the General Assembly, he resigned his chair in Lane Seminary. Being convicted by both of these bodies he retired from the Presbyterian Church and accepted a professorship at Amherst College.

Smith, Hezekiah Wright, an American engraver; born in Edinburgh, Scotland, in 1828; came to the United States in 1833 and entered an engraving establishment. In 1850 he settled in Boston, Mass. Among his most important plates are a full-length of Daniel Webster; a three-quarter length of Edward Everett; and Gilbert Stuart's head of Washington. Subsequently he removed to Philadelphia.

Smith, Hoke. See SMITH, MICHAEL HOKE.

Smith, James and **Horace,** authors of the "Rejected Addresses" and other excel-

lent humorous composition; born in London, James, Feb. 10, 1775; Horace, Dec. 31, 1779. The managers of the new Drury Lane Theater, completed in 1812 to replace the burned one, offered a prize for the most suitable opening address; the result was a deluge of such ludicrous rubbish that all had to be rejected, and Byron was commissioned to write one. The brothers Smith conceived the idea of burlesquing the style of leading poets and other men of letters and public notorieties, in a set of pieces purporting to be among the real addresses sent in to the committee but declined. Hence the volume of "Rejected Addresses," which by 1819 had reached its 16th edition, and is a livingly familiar classic still. Its travesties are hardly caricatures so much as genuine reproductions of the spirit as well as manner of their subjects. Horace subsequently published many novels and poems, the best-known among them being the "Ode to an Egyptian Mummy." James was afterward a well-known diner-out, entertainer, and contributor to periodical literature of his day; his best-known pieces are "The Taking of Sebastopol" and "Surnames Go by Contraries." James died Dec. 26, 1839; Horace July 12, 1849.

Smith, James Argyle, an American military officer; born July 1, 1831; was graduated at the United States Military Academy in 1853; served in the Confederate army during the Civil War, becoming a Brigadier-General in November, 1863; was elected State Superintendent of Education of Mississippi in 1878 and 1882; engaged in the United States Indian service in 1893–1897; and was afterward marshal of the Mississippi Supreme Court. He died in Jackson, Miss., Dec. 6, 1901.

Smith, James Francis, an American military officer and jurist; born in San Francisco, Cal., Jan. 28, 1859; was graduated at Santa Clara College in 1878; and admitted to the bar in 1881. In 1898 he became colonel of the 1st California Volunteers; went with the first expedition to the Philippines; and took part in the battle of Malate Trenches (July 31) and the capture of Manila (Aug. 13). He was promoted to command the 1st Brigade, 1st Division, 3th Army Corps, Oct. 22, 1898; was on the commission that conferred with the similar body from Aguinaldo; took part in several succeeding battles; promoted Brigadier-General, U. S. V., commanded Department of the Visayas, and was military governor of Negros, in 1899; Philippine collector of customs in 1900-1901. He was an associate justice of the Philippine Supreme Court in 1901-1903; member of the Philippine Commission in 1903-1906; governor-general of the islands in 1906-1909; became an associate justice of the United States Court of Customs Appeals in 1910.

Smith, John, one of the Cambridge Platonists; born early in 1616; the son of a small farmer in Achurch, Northamptonshire. At 18 he entered Emmanuel College, Cambridge, as a sizar; had Whichcote for his tutor, graduated B. A. in 1640; but missed a fellowship in his own college, as another Northamptonshire man already held one. However, the Earl of Manchester's clearances at Queen's College opened up for him a fellowship there in June, 1644. Here he labored with diligence as Hebrew lecturer, Censor Philosophicus, Greek Prælector, and became in 1650 dean of the college and catechist. But his feeble health gave way, and he died, after a long illness, Aug. 7, 1652, and was buried in the college chapel. His funeral sermon was preached by Simon Patrick, who wrote long after in his "Autobiography" "Blessed be God for the good I got by him while he lived." His "Select Discourses" was published in 1660, again in 1673, in 1821, and at the Cambridge press in 1859. A selection was edited by Lord Hailes in 1756. The subjects of these "Discourses" are the "True Way of attaining to Divine Knowledge," "Superstition," the "Immortality of the Soul," the "Existence and Nature of God," "Prophecy, Legal and Evangelical Righteousness," the "Shortness of a Pharisaical Righteousness," the "Christian's Conflicts with, and Conquests over, Satan," and the "Excellency and Nobleness of True Religion"—the last an especially admirable treatise, marked at once by strong thought and spiritual inwardness.

Smith, John, an English adventurer, the founder of Virginia; born in Willoughby, in Lincolnshire, England, in January, 1579. Of a daring spirit, longing for a larger and more adventurous life, he early served in the Netherlands as a soldier in the cause of liberty. He then traveled in France, visited Egypt and Italy, and, about 1602, greatly distinguished himself in the wars of Hungary against the Turks, gaining the favor of Sigismund Bathori, Prince of Transylvania. Wounded and taken prisoner by the Turks, he was sold as a slave, was harshly treated in the Crimea, and made his escape. Rumors of war in Morocco attracted him thither, and thence he returned to England about 1606.

Smith entered with enthusiasm into the project of colonizing the New World, and with Gosnold, Winkfield, Hunt, and others set out in December, 1606, with a squadron of three small vessels for Virginia, under the authority of a charter granted by James I. Amidst the unhappy dissensions, difficulties, and distress of the first years of the great enterprise, Smith rendered the most important services by his irrepressible hopefulness, practical wisdom, and vigorous government. But for his wisdom and noble

exertions the project would probably have been abandoned. He made important geographical explorations and discoveries. In 1607, ascending the Chickahominy, and penetrating into the interior of the country, Smith and his comrades were captured by the Indians, and he only, by his rare self-possession, escaped with life. He remained a prisoner for some weeks, carefully observed the country, got some knowledge of the language of the natives, and when at last they were going to put him to death he was saved by the affectionate pleading of Pocahontas, the daughter of the chief Powhatan, a girl 10 or 12 years old. Reconducted to Jamestown, Smith had need of all his energy to cheer the desponding colonists. In the summer of 1608 he explored in an open boat the Bay of Chesapeake and its tributary rivers, a navigation of nearly 3,000 miles. He also penetrated inland, established friendly relations with the Indians, and prepared a map of the country. On his return from this great expedition he was made president of the colonial council. In 1609 he was severely injured by an accidental explosion of gunpowder, and without reward for his splendid services, except in his own conscience and the applause of the world, returned to England. He visited Virginia in 1614, was captured by the French in the following year, and on his return to London after three months heard of the arrival of his Indian friend Pocahontas. Smith made known her services, and she was presented to Queen Elizabeth and loaded with marks of honor and gratitude. Smith published in 1608 "A True Relation of such Occurrences and Accidents of Note as hath Happened in Virginia since the First Planting of that Colony." He died in London, June 21, 1631.

Smith, John Lawrence, an American chemist; born near Charleston, S. C., Dec. 17, 1818; was educated at the University of Virginia and at the Medical School of South Carolina. He began the practice of medicine in Charleston in 1844, delivered a course of lectures at the Medical College and in 1846 established the "Medical and Surgical Journal of South Carolina." Later he was appointed by the State of South Carolina to assay the bullion from the gold fields of Georgia and the Carolinas; investigated meteorological conditions, soils, and modes of cotton culture; devoted four years to an exploration of the mineral resources of Turkey; was Professor of Chemistry in the University of Virginia and at the University of Louisville, and superintendent of the gas works in Louisville. From the time of his settlement in Louisville he devoted his attention to meteorites, and his collection, which he bequeathed to Harvard, was the finest in the United States. He was a chevalier of the Legion of Honor; president of the American Chemical Society; one of the commissioners to the World's Fair in Paris in 1867; a judge in the Department of Chemical Arts at the Centennial Exposition in Philadelphia in 1876; and author of many valuable reports, scientific and technical papers, etc. He died in Louisville, Ky., Oct. 12, 1883.

Smith, John Pye, an English theologian; born in Sheffield, May 25, 1774; was from 1800 to 1850 successively classical tutor, divinity lecturer, and principal of the Independent College at Homerton, where he was also for 43 years pastor of the "Old Gravel Pits Chapel." He wrote "The Scripture Testimony to the Messiah" (2 vols. 1818-1821, 4th ed. 1847); "Four Discourses on the Sacrifice and Priesthood of Christ" (1828, 3d ed. 1847); "Principles of Interpretation as applied to the Prophecies of Scripture" (1829, 2d ed. 1831); and "The Relation between Holy Scripture and some parts of Geological Science" (1839, 4th ed. 1848). He died in Guilford, Surrey, Feb. 5, 1851.

Smith, Joseph, an American naval officer; born in Boston, Mass., March 30, 1790; was appointed to the United States navy in 1809, and commissioned lieutenant in 1813. He was 1st lieutenant on the brig "Eagle" in the victory on Lake Champlain; served on board the frigate "Constellation" in the Mediterranean in 1815-1817, and in 1843-1845 commanded the Mediterranean squadron, with the frigate "Cumberland" as his flagship. On his return to the United States he was appointed chief of the bureau of yards and docks, which post he filled till 1869, when he was made president of the examining board for the promotion of officers. He died in Washington, D. C., Jan. 17, 1877.

Smith, Joseph, the founder of the Mormons; born in Sharon, Windsor co., Vt., Dec. 23, 1805. He was revered as a prophet by his followers. His parents were poor farmers who went to Palmyra, N. Y., in the hope of bettering their condition, taking Joseph with them, about 1815. Later the family removed to Manchester in the same State. According to his own story regarding his earlier years, he worked hard on his father's farm. But the "oldest settlers" reported that the family had an aversion to hard toil of any kind and seemed inclined to lead thriftless lives, spending much time in digging for possible hidden treasure. About 1820 Joseph claimed to be a constant witness of supernatural visions and to be gifted with a supernatural sight. He pretended that he received in 1828 a divine revelation inscribed in mysterious hieroglyphics on golden plates which were delivered to him by an angel, and that the "Book of Mor-

mon," which he published in 1830, was translated from those golden plates. The translation was dictated by him while he sat behind a curtain as if in the society of mysterious spiritual companions. He gathered a number of converts, and as "prophet" went with them first to Kirtland, O., and afterward to Independence, Mo. The subsequent events of his life as well as those of his brother HYRUM are detailed in MORMONS. See BOOK OF MORMON: SPAULDING, SOLOMON: YOUNG, BRIGHAM.

Smith, Joseph Fielding, a Mormon apostle; born in Far West, Mo., Nov. 13, 1838; drove an ox-team in the "exodus" of 1846; worked as a manual laborer in 1848–1854, and was a missionary to the Sandwich Islands in 1854–1857. He was ordained to one of the "seventies" in 1858 and to apostleship in 1866, becoming a member of the Council of 12 in 1867. He was several times a member of the Utah Legislature, and in 1882 presided over the Constitutional Convention which framed the constitution for the State of Utah; was director of the Zion's Coöperative Mercantile Institution and several other enterprises; and editor of the "Improvement Era." He succeeded Lorenzo Snow as president of the Mormon Church in October, 1901.

Smith, Leigh, an English Arctic explorer; after amassing a fortune was seized with a desire to spend it in a search for the North Pole. He made his first voyage to high latitudes in 1871 in his yacht "Samson," and brought back important contributions to our knowledge of the polar regions. He sailed again in 1872–1873 in the "Diana." The "Eira," a steam yacht of 360 tons burden, was built expressly for arctic exploration, and Smith sailed in her from Peterhead on June 10, 1880. Reaching Franz Josef Land, which was discovered by Weyprecht and Payer in 1874, he found it to be either one of an extensive archipelago of islands or the point of a continuous stretch of land extending to the N. W., and he discovered a desirable harbor. It is Petermann's theory that an archipelago extends right across the pole. Smith's discoveries went measurably to confirm this theory.

The gold medal of the Royal Geographical Society was awarded to the plucky and fortunate explorer, who set sail again June 13, 1881, with Dr. Neale, Captain Lofley, and a crew of 22 men, the vessel being provisioned for 14 months and having a two years' supply of flour and bread. His intention was to visit Franz Josef Land and explore its W. coast, pushing N. near the meridian of Wicke's Land, but he had no intention of passing the winter in the ice, and consequently did not indicate the area of his proposed explorations, or the line of retreat he would adopt in case of accident. The "Eira" was last seen on July 8, 1881, off the W. coast of Nova Zembla, going N. No word having been received to the ship for over a year an expedition was fitted out to send in search of her. To the expenses of this expedition the Royal Geographical Society contributed $5,000 and the government $25,000, Smith's family defraying the remainder of the cost. It consisted of a steam whaler, the "Hope," which was commanded by Sir Allan Young. It left London in June, 1882. Three other vessels were also sent in search of the "Eira," one by two other English gentlemen, another by Holland scientists, and yet another by Russians. The "Hope" reached Peterhead, Aberdeen, Aug. 20 following, bringing the entire crew of the missing vessel. The "Eira" had been caught in the ice and sunk off Cape Flora, Aug. 21, 1881.

Smith, Lyman Cornelius, an American inventor; born in Torrington, Conn., March 31, 1850; was educated at the State Normal School, and went to New York to assume the management of a live-stock commission house. He engaged in the lumber business in Syracuse in 1875, and later began the manufacture of firearms. In 1893 he invented a typewriter and organized the Smith Premier Typewriter Company, of which he became president.

Smith, Mary Louise (Riley), an American poet; born in Brighton, N. Y., May 27, 1842. She was author of "A Gift of Gentians, and Other Verses" (1882); "The Inn of Rest" (1888); and several booklets, in which are included her notably popular poems "Tired Mothers," "If," "His Name," and "Sometime."

Smith, Matthew Hale, a Unitarian clergyman and author; born in Portland, Me., in 1810. As a newspaper correspondent under the name "Burleigh" he attained reputation for vivacity and piquancy. He also made successful lecture tours. His writings include: "Universalism Exposed" (1842); "Universalism Not of God" (1847); "Sabbath Evenings" (1849); "Mount Calvary" (1866); and "Sunshine and Shadow in New York" (1868–1869). He died in Brooklyn, N. Y., in 1879.

Smith, Michael Hoke, an American statesman; born in Newton, N. C., Sept. 2, 1855; was educated by his father, and in 1872 went to Georgia, where he taught school. Subsequently he studied law; practised in Atlanta; was proprietor of the Atlanta "Journal" in 1887-1898; Secretary of the Interior in 1893-1896; governor of Georgia in 1907-1909; re-elected governor in 1910.

Smith, Richard Penn, an American dramatist; born in Philadelphia, Pa., March

13, 1799. Among his most distinguished plays are: "Caius Marius," a tragedy, presented by Edwin Forrest in 1831; "The Disowned"; and "The Venetians." His other works include: "The Forsaken," a novel (2 vols. 1831); "Life of David Crockett" (1836); and "Life of Martin Van Buren" (1836). His "Complete Works, Embodied in his Life and Correspondence" was published by his son, Horace Wemyss Smith (4 vols. 1888). He died in Falls of Schuylkill, Pa., Aug. 12, 1854.

Smith, Robert, an English mathematician; born in 1689; was cousin to the mathematician Roger Cotes, whom he succeeded as Plumian Professor of Astronomy at Cambridge in 1716. He succeeded Bentley as master of Trinity College in 1742, published "Harmonia Mensurarum" (1722); "A Complete System of Optics" (1738); and "Harmonics, or the Philosophy of Musical Sounds" (1748); edited the "Lectures on Hydrostatics and Pneumatics" of Cotes in 1737, and died in Cambridge in 1768. The two Smith Prizes, founded on his bequests to Trinity College and Cambridge University, now amounting to about $115 each, are, by a Grace of October, 1883, awarded annually for the essays of greatest merit on any subject in mathematics or natural philosophy by recent B. A.'s. Holders have been Henry Martyn, J. Herschel, Whewell, Airy, Colenso, Stokes, Cayley, J. C. Adams, Thomson, Tait, and Clerk-Maxwell.

Smith, Robert Angus, an English chemist; born near Glasgow, Scotland, in 1817. He was educated at Glasgow, and subsequently studied chemistry under Liebig at Giessen. After his return to England he made an important report on the sanitary condition of the towns of Lancashire, and his report to the British Association (1848) on the air and water of towns brought the subject into great prominence. Another report of his was on the state of the atmosphere in metalliferous mines. His special investigations into the quality of the air of towns led to his appointment as inspector-general of the alkali works of the United Kingdom. He was also inspector under the Rivers Pollution Act for England and Scotland. He died in Colwyn Bay, May 11, 1884.

Smith, Samuel Francis, an American clergyman and religious poet; born in Boston, Mass., Oct. 21, 1808. He was the author of numerous hymns, including "America," which was written in 1832; and published for young readers and others: "Knights and Sea Kings"; "Mythology and Early Greek History"; and "Poor Boys who Became Great." He died in Boston, Nov. 16, 1895.

Smith, Seba, pseudonym, MAJOR JACK DOWNING, an American journalist and political satirist; born in Buckfield, Me., Sept. 14, 1792. His publications include: "The Life and Writings of Major Jack Downing," a series of humorous and satirical letters written during the administration of President Jackson (1833); "Powhatan," a poetic romance (1841); "New Elements in Geometry" (1850); and "Way Down East" (1855). He died in Patchogue, L. I., July 29, 1868.

Smith, Sydney, an English clergyman; born in Woodford, Essex, England, June 3, 1771. Educated at Winchester School, Sydney, in 1789, entered New College, Oxford, where he took his degree of M. A. in 1796, becoming fellow a few years afterward. In 1797 he obtained the curacy of Netheravon, a village on Salisbury Plain, where he passed a secluded life for about two years. He then went to Edinburgh as tutor to a young gentleman, continued there for five years, and was one of the founders in 1802 of the "Edinburgh Review," being also one of its most influential contributors. In 1804 he removed to London, about the same time married, and became renowned as one of the wittiest and most genial of men. In 1806 he was presented to the living of Foston-le-Clay, in Yorkshire. In 1807 appeared anonymously his celebrated "Letters of Peter Plymley," intended to further the cause of Catholic emancipation. His liberal views on politics excluded him for a long time from church preferment; but in 1828 he was presented to the rectory of Combe Florey, in Somersetshire, and in 1831, during the ministry of Earl Grey, he became one of the canons of St. Paul's, London, where he henceforth resided. A few years before his death a collected edition of his writings was published under his own supervision, including papers contributed to the "Edinburgh Review," "Sketches of Moral Philosophy," etc. He wrote a "Life of Dalton," and "History of the Atomic Theory up to his Time"; "Air and Rain: the Beginnings of a Chemical Climatology"; "Loch Etive, and the Sons of Uisnach"; "Science in Early Manchester"; etc. He died in London, Feb. 22, 1845.

SYDNEY SMITH.

Smith, Sir Thomas, an English diplomatist; born in Saffron Walden, Essex, in 1512; at 14 entered Queen's College, Cam-

bridge. He early distinguished himself as a Grecian; was made fellow of his college in 1531; and two years later became a public lecturer. He and his friend Cheke attacked the prevailing mode of pronouncing Greek, which differed widely from that now in use. At first strenuously opposed, he and his colleague by patience conquered all the authorities except Gardiner, Bishop of Winchester. In 1539 he traveled on the Continent, taking a doctor's degree at Padua; and on his return he became Professor of Civil Law at Cambridge. Under Edward VI. he became a secretary of state (1548), and was knighted. While his patron Somerset was in office he was employed as ambassador to Belgium and France. At the accession of Mary he lost all honors, only retaining a pension of $500 a year; but in Elizabeth's reign he again became a secretary of state, chancellor of the Order of the Garter, and ambassador to France. His works are two inconsiderable tracts, "De Recta et Emendata Linguæ Græcæ Pronunciatione," and "De Recta et Emendata Linguæ Anglicanæ Scriptione Dialogus" (both 1568), and the better-known "De Republica Anglorum" the "Maner of Government, or Policie of the Realme of England" (1583). He died in 1577.

Smith, Thomas Southwood, an English sanitarian; born in Martock, Somersetshire, England, in 1778. He studied medicine at Edinburgh. He first settled as a physician at Yeovil, but in 1820 went to London, and was in 1825 appointed physician to the London Fever Hospital, and somewhat earlier to the Eastern Dispensary. He spent several years visiting the wards of the former, and the squalid houses of the patients of the latter, and embodied his experience in a "Treatise on Fever" (1830), which has been described by a competent authority as the best work on the subject that has ever been written. In 1832 he was appointed one of the commissioners to inquire into the condition of factory children, and his report led to the passage of the Factory Act, which put an end to the inhuman treatment to which children had been subjected in factories up to that time. His inquiry into the condition of children and young persons employed in mines led to the exclusion of children and women from British mines. In 1846 his report on the means requisite for the improvement of the health of the metropolis resulted in the Public Health Act of 1848. He also did immense service to the cause of science by his reports on cholera and quarantine. He died in Florence, Italy, in 1861.

Smith, Walter Chalmers, a Scotch poet and story-writer; born in Aberdeen, Scotland, in 1824. Among his writings are: "Olrig Grange: A Poem" (1872); "Hilda among the Broken Gods" (1878); "Raban, or Life Splinters" (1880); "North-Country Folk Poems" (1883); "Kildrostan," (1884). He died Sept. 19, 1908.

Smith

Smith, William, an English poet and novelist; wrote: "Guidone: A Dramatic Poem" (2d ed. 1836); "Athelwold," a tragedy (1842); "Discourse on the Ethics of the School of Palcy" (1839); "Thorndale; or, The Conflict of Opinions" (1857); "Gravenhurst; or, Thoughts on Good and Evil" (1862).

Smith, William, the "father of English geology"; born in Churchill, Oxfordshire, England, March 23, 1769. Acting successively as land surveyor, mining surveyor, and canal engineer, he was led to indulge in many speculations of a geological nature. He became convinced that each stratum contained its own peculiar fossils, and might be discriminated by them, and in 1815 he was able to submit a complete colored map of the strata of England and Wales to the Society of Arts, and received the premium of $250 which had for several years been offered for such a map. His fame as an original discoverer was now secure; but becoming involved in pecuniary difficulties he was obliged to part with his geological collection to government for $3,500. Subsequently a pension was granted to him by government. He died in Northampton, England, Aug. 28, 1839.

Smith, William, an English classical scholar; born in London, England, in 1813 or 1814. He was of great learning, and his works have been very influential in the guidance and extension of scholarship. They include: "Dictionary of Greek and Roman Antiquities" (1840–1842); "Dictionary of Greek and Roman Biography and Mythology" (1843–1849); "Dictionary of Greek and Roman Geography" (1853–1857); "Dictionary of the Bible" (1860–1863); "Dictionary of Christian Antiquities" (1875–1880); "Dictionary of Christian Biography, Literature, Sects, and Doctrines during the First Eight Centuries" (1877–1887), with Dr. Wace. He also published Greek and Latin text-books, dictionaries, and manuals, besides editing editions of Gibbon, Hume, Hallam, and other historians. He died Oct. 7, 1893.

Smith, William Farrar, an American military engineer; born in St. Albans, Vt., Feb. 17, 1824; was graduated at the United States Military Academy in 1845, and detailed to duty on various surveys in Florida, Texas, and the Upper Lake region. At the outbreak of the Civil War he was assigned to duty under General Butler, and later commanded a division of the Army of the Potomac at the siege of Yorktown and in the battles of Williamsburg, Malvern Hill, Antietam, etc. He commanded the

6th Corps at Fredericksburg in 1862, and was engaged in the battle of Gettysburg as commander of a division of New York and Pennsylvania militia. He was appointed chief engineer of the Army of the Cumberland on Oct. 3, 1863, and subsequently planned the battles of Brown's Ferry and Missionary Ridge; threw a bridge 1,500 feet long across the Tennessee river for Sherman's army; took part in the battles of Drury's Bluff and Cold Harbor; and directed the assault on Petersburg. After the war he resigned from the army and became president of the International Ocean Telegraph Company and of the New York Board of Police. He died Feb. 28, 1903.

Smith, William Henry, an English bookseller and newsagent; born in London, June 24, 1825; was educated at the grammar school, Tavistock, and while a youth entered his father's business and rose step by step to be head of the firm. This, the largest wholesale newspaper business of the kind in Great Britain, was founded by his father (born 1792), who saw that the London newspapers, sent off by the evening coaches only, were not delivered in Manchester and Liverpool till 48 hours after publication. He conceived the idea of forwarding the papers by express parcel, with private coaches leaving London in the morning, so that the night coaches were overtaken and the delivery of news secured 24 hours in advance. As the business expanded, to this was added the right of selling books and newspapers at railway stations (Birmingham railway, 1849). William H. Smith was as strong in organizing faculty as his father had been, and business was extended. He represented Westminster, 1868–1885; was returned for the Strand in 1885 and again in 1886. He held the posts of Financial Secretary of the Treasury (1874–1877), first Lord of the Admiralty (1877–1880), Secretary of State for War (1885); in Lord Salisbury's ministry he was first Lord of the Treasury and leader of the House of Commons till his death, Oct. 6, 1891. His widow was raised to the peerage as Viscountess Hambleden. He was distinguished for conscientious discharge of duty, and in 1889 received a handsome memorial from members of the House of Commons and was entertained at a banquet. He was honorary D. C. L. of Oxford, and received the honorary freedom of the Stationers' Company in 1880.

Smith, William Robertson, a Scotch theologian and Orientalist; born in Keig, Aberdeenshire, Scotland, Nov. 8, 1846. On concluding his theological studies at Edinburgh, Göttingen, and Bonn, he was elected to the chair of Hebrew and Old Testament exegesis in the Free Church College, Aberdeen, and almost immediately began to arouse opposition by the advanced tone of his lectures, essays, and addresses. A crisis in his career came on the appearance of his Biblical contributions to the 9th edition of the "Encyclopædia Britannica," when he was tried for heresy, but finally acquitted in 1880. His article on "Hebrew Language and Literature" in the "Britannica" led to his removal from the Free Church College professorship. The views which occasioned the controversy are set forth in "The Old Testament in the Jewish Church" (1881), "The Prophets of Israel" (1882), and many important pamphlets. Meanwhile he had been very active in Oriental studies, and in 1883 became Professor of Arabic at Cambridge. To this period belong "Kinship and Marriage in Early Arabia" (1885), and "Religion of the Semites: Fundamental Institutions" (1889). He was for a time sole editor of the "Encyclopædia Britannica." He died in Cambridge, England, March 31, 1894.

Smith, Sir William Sidney, an English naval officer; born in Westminster, England, July 21, 1765. He entered the navy at the age of 12, received his lieutenancy at 16, and when 19 was created post captain. After serving with distinction as a volunteer in the Swedish navy against Russia, and then against France under Lord Hood, he returned to England, and received the command of the "Diamond," for the purpose of cruising with a small flotilla against the French. He was made prisoner in an attempt to cut out a vessel at Havre, and was detained in confinement for two years, but contrived to make his escape. Appointed then to the "Tiger," Sir Sidney did good service in Syria and subsequently in Egypt against Bonaparte, receiving a severe wound at the battle of Alexandria. On his return to England various marks of distinction were bestowed on him, and in 1802 he entered Parliament as member for Rochester. He was created rear-admiral of the blue in 1805, and in 1806, as commander of a small squadron, inflicted signal injuries on the French off the coast of Naples. Next year he accompanied Admiral Duckworth to the Dardanelles, where he distinguished himself by the destruction of a Turkish squadron. He was made vice-admiral in 1810, admiral in 1821, and in 1830 succeeded King William IV. as lieutenant-general of marines. As a reward for his services he received a pension of $5,000 a year and the decoration of K. C. B. He died in Paris, France, May 26, 1841.

Smith College, an educational non-sectarian institution for women in Northampton, Mass.; chartered in 1871; opened in 1875; has endowment exceeding $1,350,000; grounds and buildings valued at over $1,300,000; scientific apparatus, etc., $175,000; volumes in the library, 27,500; aver-

age number of faculty, 110; average student attendance, 1,600; graduates since opening, over 4,100; ordinary income, $575,000.

Smithfield, the famous London cattle market; N. of Newgate and a little W. of Aldersgate; was once a place of recreation outside the city walls. Here Sir William Wallace was executed in 1305, and Wat Tyler met his death in 1381. The scene of several noted tournaments, it became in the reign of Mary the place for the execution of martyrs. Bartholomew Fair was held regularly at Smithfield till 1853. Smithfield is first mentioned as the site of a cattle market by Fitz Stephen in 1150. The corporation acquired in 1345 the official control over the market, which they retained for upward of 500 years. The space devoted to the market was enlarged from 3 acres to 4½, and in 1834 to 6¼. The ancient regulations were called the "Statutes of Smithfield." In the later days of the market there sometimes assembled 4,000 cattle and 30,000 sheep; the annual amount of the sales was $35,000,000. In 1846 there were sold 226,132 cattle, 1,593,270 sheep and lambs, 26,356 calves, and 33,531 pigs. Owing to the want of space and the vicinity of slaughterhouses, an act was passed in 1851 appointing metropolitan commissioners with powers to provide a new market, slaughterhouses, etc., and Smithfield was used for the last time on June 11, 1855. The new market at Copenhagen Fields, erected from designs by Messrs. Browne and Robinson at a cost of $672,300, was opened to the public Dec. 1, 1868. The Smithfield Club, to promote improvement in cattle breeding, was established in 1798, and now holds its annual cattle shows in the Agricultural Hall, Islington.

Smith's Island, a small island of North Carolina, off the coast of New Hanover county, and at the mouth of Cape Fear river; 20 miles S. of Wilmington. Its most S. point is Cape Fear. It has a lighthouse.

Smithson, James, an English philanthropist; natural son of Hugh Percy, 3d Duke of Northumberland; born in England about 1754; was graduated at Oxford in 1786, and elected a member of the Royal Society in 1787. His first paper presented to the society in 1791 was "An Account of Some Chemical Experiments on Tabasheer," and was followed from time to time by others treating of the chemical analysis of minerals, etc. In 1835 his property, amounting to $508,318, came into the possession of the United States government, having been bequeathed by him "for the purpose of founding an institution at Washington, D. C., to be called the Smithsonian Institution for the increase and diffusion of knowledge among men." He died in Genoa, Italy, June 27, 1829. In 1904 his ashes were brought to the United States for burial on the grounds of the Institution.

Smithsonian Institution, a literary, scientific, and philosophical institution, organized at Washington, D. C., by Act of Congress in 1846, pursuant to the will of James Smithson. The management of the institution is in the hands of regents appointed by the United States government, and a spacious structure, containing a museum, library, cabinets of natural history, and lecture rooms, has been the result of their able administration of the testator's wishes. The library (150,000 volumes), carefully collected, is unsurpassed in the United States as a resource for scientific reference, while in its museum are collected the rich acquisitions of national exploring expeditions. Some part of its income is devoted to scientific researches, and the production of works too costly for publication by private individuals. Departments of astronomy, ethnology, meteorology, and terrestrial magnetism, have been established. The United States Weather Bureau has grown out of its department of meteorology, and the United States Fish Commission was established in connection with its work in ichthyology. Under its direction are the United States National Museum; the Bureau of International Exchanges; the Bureau of American Ethnology; the Astro-Physical Observatory; and the National Zoölogical Park. Among the publications hitherto issued are the "Smithsonian Contributions to Knowledge," 4to., distributed gratis to libraries; "Annual Reports"; "Miscellaneous Collections"; "Reports of the National Museum" (1884–1892); "Bulletins of the National Museum"; "Proceedings of the National Museum"; and "Annual Reports of the Bureau of Ethnology." The periodical courses of lectures held in the institution by eminent scientists and savants form a prominent social feature of the national capital.

Smithsonite, an ore of zinc, occurring abundantly both crystallized and massive, also stalactitic, mammillated and botryoidal with fibrous structure. Crystallization, orthorhombic; hardness, 4.5–5; sp. gr., 3.16–3.9; luster, vitreous to sub-pearly; color, white, sometimes bluish or greenish; streak, white; brittle, pyroelectric. Composition: Silica, 25.0; oxide of zinc, 67.5; water, 7.5 = 100, corresponding with the formula $2ZnO.SiO_2 + HO$. Dana divides this species into (1) Ordinary: (*a*) in crystals, (*b*) mammillary or stalactitic, (*c*) massive; (2) Carbonated, containing from 12 to 20 per cent. of carbonate of zinc; (3) Argillaceous. As this name has been used

by different mineralogists for both the silicate and the carbonate of zinc, in order to get rid of the confusion arising therefrom, in the British Museum Catalogue, Kenngott's name, hemimorphite, has been adopted.

Smith Sound, a passage of water leading to the Arctic regions, at the N. extremity of Baffin Bay, between Prudhoe, in Greenland, and Ellesmere Land. Its S. entrance was discovered by Baffin in 1616. In 1854 it was surveyed by a United States expedition under Dr. Elisha Kent Kane. A gulf 110 miles long was found at its N. E. end.

Smock Mill, a form of windmill in which a cap turns on a vertical axis to present the sails toward the wind. The term is used in contradistinction to postmill, in which the whole mill rotates for a similar purpose. It is also called the Dutch mill, as being the form most commonly used in Holland for pumping.

Smoke, the exhalations, visible vapor, or substance that escapes, or is expelled, in the process of combustion, from the substance burning. Those fuels which consist of fixed carbon, as anthracite and the coke of bituminous coal, evolve no smoke, for the first movement of the carbon into the air is when it combines with the oxygen to form the invisible carbonic oxide, from which it is not again set free. In nearly every process of combustion, whether the object be the attainment of light or heat, the formation of smoke should be guarded against as a waste of fuel. In great cities, where bituminous coal is consumed on a large scale for manufacturing purposes, the atmosphere is constantly charged with clouds of smoke, which is diffused over everything. In Pittsburg, for instance, so great is the nuisance that white articles of external dress are almost discarded in consequence of their becoming immediately soiled. Several plans, at once efficient and economical, have been supplied to manufacturers. The object of these plans has been either to prevent the production of smoke by effecting complete combustion in the furnace, or to consume the smoke after it has been evolved from one fire by causing it to pass over another supported by smokeless fuel. It has been ascertained that the great mass of smoke is sent forth from fuel freshly thrown on a fire, and that when the fire becomes hotter, the smoke diminishes. This is owing to the sweeping off of the carbon before it could be fairly exposed to the further action of the heat and air. This leads to the method which adds the fuel gradually, and spreads it over the front portion of the grate, so that the smoke shall have to pass over the fire behind, and thus be consumed as it mixes with the excess of air carried along with it; hence this method of preventing smoke by consuming it in the furnace has been adopted very generally. Other inventions are based on supplying fuel to the fires from beneath, so that the products of combustion must pass through the incandescent coals above before escaping.

Smoke Ball, in ordnance, a paper shell filled with a composition which, when ignited, emits volumes of smoke. Smoke balls are thrown into military mines to suffocate working parties, or into forts to cover an advance. They have also been used as signals.

Smoke Box, a chamber in which the smoke and heated gases of the flues are collected, and from which they pass to the chimney, funnel, or stack. Some forms of reverting-flue boilers have smoke boxes at each end. In locomotives, the end of the boiler on which the chimney is placed. It receives the draught from the tubes. Locomotives with inside cylinders have them placed in this box, which keeps them and the steam pipes at a high temperature.

Smokeless Powder. See GUNPOWDER.

Smoke Plant, a beautiful deciduous South European shrub, *Rhus cotinus*, natural order *Anacardiaceæ*, yielding the yellow dyewood called young fustic, and used also in tanning.

Smoky City. See IRON CITY.

Smoky Hill River, or **Smoky Hill Fork,** a river whose source is in Eastern Colorado, and which flows into the State of Kansas. It traverses Grove, Trego, Ellis, Russell and Ellsworth counties, and 10 miles W. of Abilene unites with the Solomon river, the two streams forming the Kansas river. On both banks are extensive fertile prairies. It is 400 miles long.

Smoky Mountains, or **Great Smoky Mountains,** a range on the boundary of North Carolina and Tennessee; is a part of the Appalachian system. Mount Guyot, 6,636 feet high and Clingman's Peak 6,660 feet high, are among its loftiest summits.

Smolensk, a town of Russia in Europe, capital of a government of the same name, on the Dnieper, 230 miles S. W. of Moscow. It is the see of an archbishop, and has three cathedrals, numerous churches, monasteries, and an episcopal palace. It has, besides, numerous schools, a college, hospitals, a house of correction, and assembly rooms. Manufactures, linens, leather, carpets, and soap. Smolensk was the scene of an obstinate conflict between the French and Russians, Aug. 16–17, 1812, in which victory is claimed on both sides. The day following, Aug. 18, the French returning to the attack, found the city deserted and in ruins. Pop. (1897) 46,899.

Smollett, Tobias George, a British novelist and miscellaneous writer; born near Renton, Dumbartonshire, Scotland, in March, 1721. He was educated at the University of Glasgow, and was apprenticed to a surgeon. In 1740 he went to London and obtained the situation of surgeon's mate to one of the ships that went out in the unfortunate expedition to Carthagena in 1741 under Admiral Vernon. Of this affair he gave an account in his "Compendium of Voyages and Travels" (7 vols. 12mo, 1757). Disgusted with the navy, Smollett quitted the service and resided for some time in Jamaica. On his return to London in 1746 he heard of the barbarities of the Duke of Cumberland in the N. of Scotland, and gave utterance to his indignation in the well-known ode entitled "The Tears of Scotland." In the same year he published his "Advice: a Satire"; and in 1747 appeared his "Reproof: a Satire," being the second part of "The Advice." In 1748 he published his "Adventures of Roderick Random," a novel which brought him both fame and fortune.

TOBIAS GEORGE SMOLLETT.

He went to Paris in 1750, and about this time wrote his "Adventures of Peregrine Pickle," which appeared in 1751. He now obtained the degree of M. D., but never succeeded in practice. In 1753 he published his "Count Fathom," a work neither so ably written nor so popular as its predecessors. In 1755 he brought out a new translation of "Don Quixote." Soon after this he was induced to take the chief management of the Tory organ, the "Critical Review." In 1757 he produced "The Reprisal," a comedy in two acts, which proved a success. In 1758 appeared his "History of England from Julius Cæsar to the Treaty of Aix-la-Chapelle in 1748." For a libel in the "Critical Review" he was sentenced to pay a fine of $500 and to suffer three months' imprisonment. During his confinement he composed his "Adventures of Sir Lancelot Greaves" (published in 1762). In 1761, 1762, and 1765 appeared his "Continuation of the History of England down to 1765," since often reprinted as a continuation of Hume's history. In 1766, after a residence of about two years on the Continent, he published his "Travels through France and Italy"; and 1767 his "History and Adventures of an Atom." He again visited Italy in 1770, and near Leghorn he wrote his "Humphrey Clinker," which is regarded as the best of all his works. The humor of Smollett is of the broad, full-flavored kind, not seldom degenerating into burlesque; his characters are well marked and varied; and though his work is frequently coarse and vulgar, it has had much influence on English fiction. He died in Monte Nuovo, near Leghorn, Italy, Oct. 21, 1771.

Smolt, a name given to young river salmon when they are bluish along the upper half of the body and silvery along the sides.

Smoothing Irons, domestic implements of iron or steel with a flat face for smoothing linen, etc. There are many varieties which mainly differ in the modes of heating and nature and attachment of the handle. The common sad-iron, consisting of a solid triangular heater and handle of cast iron, remains in use notwithstanding the drawbacks of heating it before a fire and its hot handle. These are removed in many devices of recent introduction by making the body of the iron hollow, and heating it by incandescent charcoal, the flame of gas or a lamp, or a red-hot iron heater. A handle of wood or of perforated iron, which in some kinds is detachable, is also substituted for the solid cast-iron one. It is made of steel, lined with a non-conducting fire cement which heats quickly and remains hot for a long time. The handle is of wood and is removable, so that one handle only is required for a set of smoothing irons of the same kind. An Italian iron for crimping and smoothing frills, etc., consists of a narrow hollow cylinder with one end closed and rounded and the other open. A tapering red-hot heater is introduced into it, and the articles to be ironed are pressed gently against the heated surface.

Smooth Serranus, in ichthyology, the *Serranus cabrilla*, common in the Mediterranean, reaching S. to Madeira. The view, sanctioned by Cuvier, that this fish is hermaphrodite, one lobe of the roe consisting of ova and the other of milt, is probably an error due to some peculiarities in the reproductive apparatus.

Smooth Snake, in zoölogy, the *Coronella lævis* (or *austriaca*), called also the Austrian snake, common in Southern and Central Europe. It is about two feet long, shiny brown with irregular patches of black, yellow mark on back and sides of head, under surface yellowish with black spots.

Smooth Sole, in ichthyology, the *Arnoglossus laterna*, the megrim, or scald-fish, a small species, four or five inches long, common in the Mediterranean, and extend-

ing to the N. coast of the English Channel.

Smorzato, a musical direction denoting that the sound is gradually to die away. In violin playing this is achieved by drawing the bow to its full extent in gradually lighter style.

Smriti ("that which is remembered and handed down by tradition"), the Sanskrit term for the whole of the Post-Vedic literature, which is believed to be founded on direct revelation, though delivered by human authors. It includes the Laws of Manu, the Mahabharata and Ramayana, the Puranas and Tantras. It is opposed to Sruti, or revelation.

Smuggling, originally and strictly a crime of commerce, a violation of customs laws, to be distinguished from such a crime of manufacture as illicit distillation, which violates excise laws. But the term is commonly applied also to the evasive manufacture and disposal of commodities liable to excise as well as to the clandestine importation of articles on which customs duties have been imposed. Defrauding the government of revenue by the evasion of customs duties or excise taxes may therefore serve as a definition. The evasion of customs duties is the prevailing sense of the term in the popular mind, a sense in which there are in all nations stirring stories of smuggling rich in romantic incident. But, in the accepted use of language the other sense is quite common. A case reported (June, 1891) in the leading newspapers, as "Smuggling in London," was that of two men brought before a police court on the charge of defrauding the revenue by illicit distillation in a warehouse in Holborn. A great deal of smuggling of the manufacturing kind is constantly carried on all over Great Britain and Ireland. The government is regularly defrauded of revenue in this way to a far greater amount, it is believed, than it is now by the commercial smuggling reported annually by the commissioners of customs. We read frequently of raids by revenue officers on smuggling bothies in the Highlands of Scotland. In July, 1891, an important seizure was reported to have been made in one of the haunts of a smuggling fraternity on the Gairloch, between whom and the people of the Outer Hebrides, where no distilleries exist, a brisk trade in spirits is carried on. But men well qualified to form a correct opinion believe that the revenue is defrauded by illicit distillation all over the country a great deal more than it is in the wild districts of the N. In the manufacturing centers skillful mechanics make their own utensils and tools for the purpose, and repair and alter them easily. The Highlanders are obviously at a disadvantage in this respect. Since the duty was taken off malt by Mr. Gladstone in 1880 there have been facilities for this kind of smuggling which, there is good reason to believe, have been taken advantage of in the cities and manufacturing towns, and an occasional find of the kind is reported. But the revenue of the country is buoyant, and it is not desirable to make too frequent exposure of crimes so obviously created by act of Parliament; the chiefs of the excise branch of the inland revenue department do not, accordingly, encourage too curious inquiry on the part of local revenue officers. In these circumstances exact information on the subject is not available.

Smuggling, in the sense of evading customs duties by dealing in contraband goods, has ceased to deserve the name of a trade in the United Kingdom. From about the close of the 17th century to nearly the middle of the 19th century the suppression of that kind of free trade by vigorous methods of prevention engaged the close attention of the inland revenue department. Free trade as a national policy has put down the smuggling trade. Only a very small number of persons comparatively deal in contraband goods now. But when the duties on spirits were higher in England than in Scotland, Northumberland and Cumberland were haunted with smugglers. Haddington and Berwick and the Scotch counties on the Solway were long demoralized by unwise tariffs on articles of import from abroad. Readers of Scott's novels know the effective use he makes of smuggling for the purposes of his art in "Guy Mannering" and "Red-gauntlet." Robert Burns was an exciseman, and it was also one of his duties to prevent the smuggling of contraband goods. It is well known how in 1792 he placed himself on one occasion at the head of the revenue officers and a guard of dragoons, waded the Solway sword in hand, was the first to board a smuggling brig, captured the crew, and had the brig sold at Dumfries. It was on that occasion that Burns wrote "The Deil's awa wi' the Exciseman." The exploits of smugglers and coastguardsmen in the frequent and bloody encounters that took place constitute the main interest of many an exciting tale.

The contrabandista used to be one of the most popular characters in Spain. The exports from England to Gibraltar, to refer only to one of his lines of activity, used to be large, and were introduced by smugglers to the interior of Spain. It was remarked 60 years ago or more that it would be nearly impossible to prevent the smuggling of British goods into the United States on the Canadian frontier if the duties on importation were excessive. These duties are now very excessive, and inferences are allowable; but the United States government does not compile statistics of smuggling either by the frontier or by the ports. The injudicious tariffs which used

to be imposed by both England and France encouraged smuggling to an enormous extent on both sides of the English Channel; spirits, especially brandy, tea, tobacco, silk goods from France; from England the most important article of illicit trade was cotton twist. English goods were introduced into France chiefly by the Belgian frontier, and dogs were trained to convey them; a dog would convey goods worth from $100 to $250. There used to be cruel slaughter of these dogs, a reward of three francs being given by the customs authorities for every one seized. A great historical outburst of smuggling was the answer which commercial enterprise gave to Napoleon's Berlin and Milan decrees. Silk from Italy reached England by Smyrna after being a year on passage, by Archangel after being two years. Cotton twist, coffee, sugar, tobacco, were shipped from England to Salonica, conveyed thence by mules and horses through Servia and Hungary to Vienna, and distributed over the Continent from that capital. Coffee from London would reach Calais by Vienna. The risks and expense raised the price of sugar on the Continent to 12 cents a pound.

In 1831 an official report estimated the loss by smuggling to the British revenue as exceeding $4,000,000 a year (in French brandy to the extent of $2,500,000). Three-fourths of the tobacco consumed in Ireland was smuggled; the total annual cost of protecting the revenue was then from $3,500,000 to $4,000,000. In 1840 it was believed that 48 per cent. of French silks paid no duty. The S. coast of England, especially Kent and Sussex, was largely addicted to the smuggling trade with France, by which it was stated that goods to the value of $10,000,000 were conveyed into France from England by the Belgian frontier alone. Till a comparatively recent date the Isle of Man was a great emporium for smuggling into England, Scotland, and Ireland.

In the "Cornhill Magazine" for June, 1891, there is an article on smuggling still carried on across the Swiss-French frontier. Tobacco, sugar, and coffee are smuggled from Switzerland into France; cattle, gunpowder, and household goods from France to Switzerland. "The smugglers usually pass the frontier," says the writer, "by a dangerous passage across the river Doubs and the rocks of its vicinity, called the Saut du Doubs. The perils of this romantically beautiful passage are increased by the darkness, the fear of custom-house officers, and by heavy packages of contraband goods which impede the free use of the limbs. Each man is armed with an alpenstock and a pistol; he carries his burden fastened to his back by a heavy strap which can be detached and the bundle rolled down the adjacent precipice at the first signal of danger and pursuit." Such is the serious business of men who make smuggling a trade on that frontier. But, in a less risky way, "wagoners, dogs, travelers, railway officials, and even the custom-house officers themselves are all more or less engaged in smuggling. . . Ladies, ever alive to the delights of a bargain, are invcterate smugglers." The writer tells us that the smugglers who make a business of it are admired and aided by the peasants on both sides of the frontier. Morality is popularly regarded as immutable, and tariffs are very mutable. The people never did associate ideas of right and wrong with smuggling in any country. The smuggler was everywhere regarded as a benefactor, because the people believed that he supplied better articles at a cheaper rate than those on which customs or excise duties were paid. Adam Smith put this strongly when he said that to pretend to have any scruple about buying smuggled goods would in most countries be regarded as a pedantic piece of hypocrisy.

Smut, in botany, dust-brand; a fungus, *Ustilago segetum* (or *Carbo*), which attacks the ears of barley, oats, and rye, but is seldom found on wheat. In appearance it resembles bunt, but it is inodorous. When examined microscopically, the black powder is found to consist of round spores, smaller than those of bunt and without reticulations. It has been ascertained that one square inch of surface would contain not less than eight millions of spores.

Smynthuridæ, in zoölogy, a family of *Collembola*. Antennæ four-jointed, terminal segment long, ringed; saltatory appendage composed of a basal portion and two arms; tracheæ well developed. There is but one genus, *Smynthurus*, with several species.

Smyrna (Turkish, Izmer), an ancient city and seaport of Asiatic Turkey, on the W. coast of Asia Minor, at the head of the gulf of the same name. The appearance of the city from the sea is extremely attractive, but a closer inspection dissipates the illusion. The houses, mostly built of wood, are mean and fragile looking; the streets close and filthy and filled with intolerable stenches proceeding from the sewers and drains. The city is divided into four quarters — Frank, Turk, Jew, and Armenian. There is an English hospital, church, and burying-ground, one or two English schools, and numerous schools for Turks, Greeks, and others; all sects and faiths having complete toleration, Smyrna has been for centuries the most important place of trade in Asia Minor. The chief imports are cotton manufactures, woolen cloths, colonial goods, iron, steel, and hardware goods. The principal exports are

dried fruits (especially figs), cotton, silk, goats' hair, sheep and camels' wool, valonia, madder root, yellow berries, sponges, and opium. The origin of Smyrna is lost in antiquity. It laid claim to the honor of being the birthplace of Homer, and no doubt was a Greek city as early as the date assigned to the poet. It was afterward taken by the Lydians, was restored by Antigonus and Lysimachus, generals of Alexander the Great, became the capital of An-

COIN OF SMYRNA.

tigonus and a flourishing city. During the Roman civil wars it was taken and partly destroyed by Dolabella, but soon recovered. It early received Christianity, and was one of the "seven churches" of Asia. In the 13th century only the ruins of its former splendor were left; but after the Turks became masters of the country it revived. It has repeatedly suffered from earthquake. Pop. estimated at 200,000.

Smyrna, Gulf of, formerly the Hermæan Gulf, an inlet of the Ægean Sea on the coast of Asiatic Turkey, so called from the town of Smyrna, which stands at its head. It is 40 miles in length by 20 at its broadest part, and contains several islands and affords good anchorage.

Smyrnium, in botany, Alexanders; the typical genus of *Smyrnidæ*. Umbels compound; bracts and bractioles few or wanting; calyx-teeth minute or absent; petals lanceolate or elliptical, with an inflected point; fruit of two nearly globose lobes or carpels, each with three dorsal, prominent sharp ribs, the two lateral ribs obsolete; vittæ several. Six or seven species, from the north temperate zone of the Eastern Hemisphere.

Smyth, Charles Piazzi, an English astronomer; born in Naples, Italy, Jan. 3, 1819; was employed at the observatory at the Cape of Good Hope (1835–1845); astronomer royal for Scotland (1845–1888); retired on a pension in 1888. His studies of the great Egyptian pyramid led him to the conclusion that the structure was raised under direct inspiration of God, and that therein were deposited revelations of the great truths of physical nature. He wrote "Our Inheritance in the Great Pyramid" (3d ed. 1880). He died Feb. 21, 1900.

Smyth, [Samuel] Newman [Phillips], an American clergyman and religious writer; born in Brunswick, Me., June 25, 1843; was graduated at Bowdoin College in 1863; served as lieutenant in 16th Maine regiment (1864–1865); was graduated at Andover Theological Seminary (1867); held pastorates at Providence, R. I., Bangor, Me., Quincy, Ill., and New Haven, Conn. His publications include: "Old Faiths in New Light"; "The Orthodox Theology of Today"; "The Morality of the Old Testament"; "Personal Creeds"; "Christian Ethics"; "The Religious Feeling"; "The Reality of Faith"; "The Place of Death in Evolution"; etc.

Smythe, William Ellsworth, an American journalist; born in Worcester, Mass., Dec. 24, 1861; was the editor of the Kearny "Enterprise" and assistant editor of the Omaha "Bee"; initiated the National Irrigation Congress of 1891; established the "Irrigation Age" in 1891, and edited it till 1896; founded the notable settlement of New Plymouth, in Idaho, in 1895, and lectured extensively on irrigation and Western institutions throughout the United States. He was the author of numerous works, including "The Conquest of Arid America"; "Real Utopias of the Arid West"; "The Struggle for Water in the West"; etc.

Snail, the common name of gasteropodous mollusks comprising the numerous family *Helicidæ*. They feed chiefly on vegetable substances, though they are very indiscriminate in their appetite and even devour the dead of their own kind. The mischief which they do to garden crops is too well known; and gardeners lay down cabbage leaves and the like to attract them, in order that they may be destroyed — any greasy substance increasing the attractiveness of the bait. Snails delight in warm, moist weather;

COMMON SNAIL.

a, eggs; b, appearance when newly hatched; c, slightly advanced stage; d, mature snail.

in dry weather, their chief time of activity is during the night, and they hide themselves by day; but after rain they come forth at any hour in quest of food. At the approach of winter or in very dry weath-

Snail Farming

er they close the mouth of the shell with a membrane (epiphragm), formed by the drying of the mucous substance which they secrete, and become inactive and torpid. Snails retreat into crevices for the winter, or into holes which they make in the earth, and which are roofed over with earth, dead leaves, etc., agglutinated by secreted mucus. The great vine snail, or edible snail (*Helix pomatia*), a European species, was considered by the ancient Romans one of their table luxuries. In some countries, as Switzerland and parts of France, they still form a considerable article of commerce. They are fed by thousands in places called "escargatoires," which are made on purpose for them. They are used, boiled in milk, for diseases of the lungs, and are sent to the United States as a delicacy.

Snail Farming. The word "snail" almost invariably calls to mind that long, slimy, yellow creature in gardens and on damp garden paths usually in the cool of the morning. One is too likely to confuse this unprepossessing slug with the little animal that carries on its back its dainty spiral house. But it will be seen that while they both belong to the same family, there are as many and as great differences between them as there are between the members of any other family of animals. The snail, with its wonderful power to construct a delicate, even and beautifully tinted shell, seems of a much higher order than the slug. And so the idea of raising snails is not repulsive after all, but has an odd flavor of interest about it.

The demand for snails in the markets of the United States is increasing, and a beginning has been made to raise edible snails for the purpose of supplying merchants. In the Chinese markets on the Pacific coast a person may buy at almost any time live snails which have been imported from the rice fields of China. These sell for 10 cents apiece or 10 cents a dozen, according to the quantity on hand and arrival of steamers. But the Italians use principally the French canned snails, which are worth 50 cents a can, 20 shells served with each can.

Snail raising is, however, accompanied with some risk; not so much to the grower as to the grower's neighbors, if he have any. A case in point occurred in Oakland, Cal., where a Frenchman who had a small yard in the rear of the cottage which he tenanted turned the yard into a snailery for the culture of edible snails for his own use and for the market. The stock thrived and multiplied so rapidly that the small domain provided for them was soon too limited for their support and comfort, and they climbed the fences and invaded the cultivated grounds and conservatories of neighboring residents, devouring every tender leaf which came in their way and leaving desolation in their wake. The French snail grower was forced out of the business, but the pest he unwittingly introduced in the commendable desire to supply his table with a dainty and his purse with coin spread over several blocks of neighboring territory and defied extermination.

A well-known conchologist of San Francisco has established a "snailery," for the purpose of determining the kinds of snails that are best adapted to that section and the best method of cultivating them. He began his experimenting with a box or cage 3 by 4 feet and 1 foot deep. It was half-filled with rich, moist earth, a quarter of which was planted with canary seed that had grown to a height of six or seven inches. Looking closely into this miniature grainfield one could seen snails moving about, nibbling the tender green shoots or roaming among the delicate stalks. There were also lettuce leaves scattered at random. and wherever a snail had crawled on one of these he was eating voraciously. The inclosed little animals were prevented from escaping by a screen covering the whole top of the box, and a dark-colored shawl was thrown over half of the screen to preclude the light, for snails thrive only in shady, secluded spots. It will be observed, also, that in moving they travel away from the light, and in the darkest corner of the box was the largest number of snails. Temperature is another consideration of importance in the propagation of snails. Extremes of heat or cold prove detrimental and to produce rapid and successful growth an even and moderate condition of atmosphere is essential. The scientist visits his "snailery" every morning to sprinkle the earth with water, using a small watering pot for the purpose, to supply fresh lettuce or the more tender parts of the cabbage or cauliflower, of the latter of which they are very fond, and to remove any snails that may have died, for snails are more dainty than one supposes, and decomposing material kills them very rapidly.

A difficulty to be overcome was in the treatment of the snails of cannibalistic tendencies. One morning after having placed some of these snails in the "snailery,' the conchologist found, to his dismay, that dozens of the shells of other species of snails were empty. And so he had to prepare a separate box for the cannibals, and even then they were so carnivorous in their habits that they often consumed their own kind. When young, snails are very active, and it is necessary to observe the greatest care to keep them in captivity. If the screen top is once left off the box the snails will crawl out, and though the species of the United States are less gregarious than those of Europe (and the largest number in this

collection are from the United States), they still like company well enough to follow their leader and escape imprisonment. Imagine the consternation of the snail raiser to enter his conservatory at evening and find the box almost empty, and snails on the table, flower pots, leaves, windows and curtains. This is what did happen, and will always happen unless the necessary precautions are taken.

One of the first questions that presents itself to the visitor to this odd collection of little animals is, how many snails are in the box at one time? At a rough guess, the scientist will tell you that there are 600 representing 20 species. And these have come from all parts of the world — Cuba, Mexico, Louisiana, New York, Kansas and other places. Of the United States varieties, there are a dozen, from as many different States, and about the same number are natives of San Francisco.

This enthusiastic collector of snails when passing a restaurant one evening observed a live snail in a glass in the window. He went in and asked the proprietor of the restaurant if he would sell it. The proprietor answered in the affirmative, and stated his price of 50 cents. The scientist gladly placed the necessary half dollar on the counter and went off with his prize. He immediately made a study of the animal and found that it belonged to a Mexican edible variety, *Helix buffoniana*. It was very large, measuring nearly three inches when stretched to full length. When making his daily visit to the "snailery" one morning he discovered dozens of tiny, yellow shells moving about the box very actively. On counting them he found that there were 62 in all of this odd Mexican variety. They were not so large as a small pea, and some were even then just making their appearance above the ground where the parent snail had bored a hole and deposited the minute eggs.

It was then the owner's special care to watch the growth of these little creatures. He found that they developed faster than any other specie in his collection, and that some grew to b quite large. The original snail lived for many months afterward, and may then have been several years of age.

There is one other interesting species, *Bullimulus Pallidior,* from Lower California, presented to the owner by the Academy of Sciences. This is one of the prettiest and most distinctive varieties represented in the "snailery." The shell is a pure white spiral, pointed, an inch long and greater in length than in breadth. It resembles very closely a sea shell. The most common of the San Francisco species is the *Lysinoe Nickliniana* variety *reticulata*. It is about as large as a medium-sized button, and may

be found on doorsteps or garden walls. It does not inhabit gardens.

The largest of the native San Francisco snails, *Helix arrora*, is found only in the S. portion near the county line. It is banded with a dark chestnut ring and is lined with lavender. The lip of this snail is as white as the purest china, and the size of the animal compares with that of a walnut, though full-grown ones may be much larger. It is found under and around lupin bushes.

The *Pupa californica*, found on Lone Mountain, also infests lupin bushes principally. But this little creature is as small as a pinhead, and is therefore not easily seen. It was found and named by Dr. Rowell. Another rare shell, of which there are only two living, has a hairy epidermis. It is dark colored, large and flat and is catalogued at 50 cents. It may be found in Marin county.

The snails of the *Helix armigera* variety attract some attention perhaps because they sometimes have a little white tooth in the aperture, and perhaps because they are a rarity in the "snailery." The scientist has not discovered why they do not seem to thrive well. They are found in very moist places, usually along the banks of streams, and are very modest creatures, withdrawing into their shell at the slightest touch, and not issuing from it again for a long time.

Freaks in nature appear among snails as they do in any other form of natural life, and we have albino forms of the *reticulata*. These are pale lemon color, with no band, and are found about one in every 1,000 specimens. You may see only about half a dozen albinos in the "snailery" and many hundreds of *reticulata* have been raised to produce this small number of "freaks."

The "cannibal" snail is the *Selenites vancouverensis*, and has a leaden-colored shell with a whitish body. It may be found on the banks of the stream leading out of Mountain Lake, in the vicinity of the Children's Hospital. If this animal is placed on the hand its bite will feel like the prick of a pin. There are only two other cannibal varieties found in San Francisco, and it is a question with conchologists which is a form of the other. *Zonites Cellarius* was introduced from the East, and may be found in gardens. *Zonites Lucidus* is a native of France, and is found on leaves, not in gardens. Both feed on everything, and among themselves it is a matter of "survival of the fittest," for they will devour one another.

Snail Flower, in botany, the *Phaseolus caracalla*. The specific name was given it by the Portuguese, who first brought it from South America, from the resemblance of the flower to the Gallic mantle so called, from which the Emperor Caracalla was named, or nicknamed. It is cultivated in gardens

in India and in colder climates in greenhouses.

Snake, a serpent, any species of the order *Ophidia*. The best-known harmless snake is probably the common snake, known also as the ringed or grass snake. The black snake, of which there are two species, is also very common in the United States. The common snake has no poison fangs, but is furnished with scent glands which secrete a volatile substance of offensive and penetrating odor. Snakes are partial to damp situations and enter water readily, swimming with ease. They are very voracious and swallow their prey—frogs, mice, and small birds—alive and entire, their teeth, which are in two rows on each side of the jaws and directed backward, being too weak to tear or masticate. See SERPENT.

Snake Eel, in ichthyology, a popular name for *Ophiurus*, an old genus of *Murænidæ*, in which the extremity of the tail was free and not surrounded by a fin.

Snakehead, in botany, the *Chelona glabra*, the only American species of the genus *Chelona*, order *Scrophulariaceæ*. It is a plant of brooks and wet places, with flowers shaped much like the head of a snake, the mouth opened and tongue extended. Stem mostly simple, two feet high, erect; flowers large, contracted at the mouth, with short, gaping lips; filaments hairy; style long, erect, bending downward.

Snake, or **Lewis, River,** also called by the Indian name SHOSHONE, the longest branch of the Columbia river; rises in the southern part of Yellowstone park, and flows first S. E., then W. and N. W. through Idaho, then N. on the boundary line between that State and Oregon, and finally W. until it joins the Columbia in the S. part of Washington. The greater part of its course is through a mountainous country, and it is celebrated for its cañons, which are from 1,000 to 4,000 feet deep. Picturesque rapids and cascades are characteristic of this stream, Shoshone falls (*q. v.*) being the most famous. The entire length of Snake river is estimated at 900 miles, and it is navigable for about 170 miles above its mouth.

Snakeroot, the popular name of numerous American plants of different species and genera, most of which are, or formerly were, reputed to be efficacious as remedies for snake bites. See ARISTOLOCHIA and SENEGA.

Snake Stones, a popular name of those fossils otherwise called ammonites. The name is also given to certain small rounded pieces of stone, or other hard substance, popularly believed to be efficacious in curing snake bites.

Snake Wood, in botany: (1) The genus *Ophioxylon*. (2) *Brosimum aubletii;* called also *Piratinera guianensis;* an artocarpad, 60 to 70 feet high, growing in Brazil. The beautiful heart wood, called from its markings snake wood, is exceedingly hard. (3) *Strychnos colubrina*, a climbing Indian plant, with tendrils believed by native doctors to be a cure for the poison of the cobra. (4) The genus *Cecropia*.

Snake Worship. See SERPENT WORSHIP.

Snapdragon. See ANTIRRHINUM.

Snapping Turtle, the *Chelydra serpentina*, widely distributed over the United States. They grow to a considerable size, a weight of 20 pounds being far from uncommon, and are prized as food. Their popular name is derived from their ferocity in captivity, and their habit of biting or snapping at everything that comes in their way. Called also alligator terrapin and alligator tortoise.

Snarling Iron, a tool used for fluting or embossing works in sheet-metal, when, from their shape, swages cannot be applied. Its two ends are oppositely curved, one being held by the jaws of a vise, and the other inserted through the mouth of the vessel and applied to the part to be raised. The iron is struck with a hammer, and the reaction gives a blow within the vessel, throwing the metal out in form corresponding to that of the tool, whether angular, cylindrical, or globular.

Snatch Block, a block used on ships, with an opening (notch) in one cheek to receive the bight of a rope. The block is iron-bound, with a swivel hook. The portion of the strap which crosses the opening or snatch in the shell is hinged, so as to be laid back when the bight of the rope is to be inserted, when warping the ship. This saves the trouble of reeving the end through. Large blocks of this kind are called rouse-about blocks.

Sneehätten (snā-het′en; "Snow-cap"), a mountain in Norway with an altitude of 7,566 feet. It rises from the midst of the Dovre Fjeld, an extensive tract of country, from 40 to 50 miles in extent in every direction, and between 3,000 and 4,000 feet above the sea-level.

Sneeze Wood, the *Pteroxylon utile*, natural order *Sapindaceæ*, one of the largest and most valuable trees in Cape Colony, sometimes yielding logs 80 feet long by 4 feet in diameter. The wood is of a yellowish color and has a handsome appearance somewhat resembling satinwood in the grain. It is difficult to work owing to its great hardness, but is believed to be very durable. It is employed for cabinet

making, for carpentry work, and for engineering purposes. Neither the white ant nor the teredo, it is said, will penetrate it. Its native name is Umtati, and it derives its English name (a translation of the Dutch *Nies-hout*) from the irritating nature of the dust which results from sawing or otherwise working it, and which causes sneezing.

Sneeze Wort, in botany, the *Achillea Ptarmica* (*Ptarmica vulgaris*), a common plant with linear, serrulate leaves. The root stock is aromatic, the whole plant pungent and sialogogue.

Sneezing, a sudden violent and convulsive explosion of air through the nostrils, with a peculiar sound. It is preceded by a more or less long-drawn and deep inspiration, like that which precedes coughing; but the opening from the pharynx into the mouth is closed by the contraction of the anterior pillars of the fauces and the descent of the soft palate, so that the force of the blast is driven entirely through the nose. It is caused by the irritation of the inner membrane of the nostrils, and is designed to throw off any particles causing the morbid action. It is often one of the earliest symptoms in coryza. Also a medicine to promote sneezing; an errhine; a sternutatory. A large body of folklore has gathered round sneezing. According to Aristotle (Prob., xxxiii: 7), in his days a single sneeze was considered a holy thing. The custom of saluting a person sneezing existed in classic times, is still found among the Jews and Moslems and almost all races of lower culture, and lingers in Europe, though here the early idea that sneezing was due to spiritual possession has vanished.

Snelling Fort, a military post in Hennepin co., Minn., on the Mississippi river, opposite St. Paul.

Snider (named after Jacob Snider, the inventor), a breech-loading rifle. The breech action consisted of a simple plug containing an oblique needle, and being hinged on its right side was opened by means of a thumbpiece in a short motion from left to right. The cartridge, at first of paper, but afterward of thin sheet brass, with a metallic base cup containing the detonator, and assisting to prevent the escape of gas, was put in, and the breech closed. The gun was fired by pulling an ordinary trigger, releasing a common hammer which drove the needle into the base cup. It was also provided with an automatic extractor for the latter, which came into operation when the breech was opened.

Snider, Jacob, inventor of a method for converting Enfield muzzle-loading rifles into breechloaders, originally a Philadelphia wine merchant; busied himself in inventions connected with dyeing, brewing, coach wheels, the sheathing of ships, etc., and went to England in 1859 to induce the British government to adopt his system of breech loading or converting. In this he succeeded, but for one reason or another found himself unable to obtain the expected remuneration. He died Oct. 25, 1866, without having received the reward of his labors, worn out by delays, lawsuits, poverty, and debts.

Snider, Denton Jacques, an American author; born in Mt. Gilead, O., Jan. 9, 1841; was graduated at Oberlin College in 1862. His studies of the great poets, Homer, Shakespeare, Dante, Goethe, and his writings on kindred topics, are very numerous, comprising some 18 volumes. He wrote also "The Freeburgers" (1889), a novel; "Psychology and the Psychosis" (1896); "The Will and Its Word" (1899); "The Psychology of Froebel's Play-Gifts" (1900); and in verse, "Delphic Days" (1878); "Agamemnon's Daughter" (1885); "Prorsus Retrorsus" (1890); "Johnny Appleseed's Rhymes" (1894); etc. His book "A Walk in Hellas" (1882); is a remarkable study of Greece as it is today, illuminated by what it was in its prime.

Snieders, Jan Renier (snē'ders), a Dutch novelist; born in Bladel, North Brabant, Nov. 22, 1812. His stories are mostly tales of village life. Among them are "Amanda"; "Doctor Mareus"; "Narda." He died in Turnhout, April 9, 1888.

Snifting Valve, a valve commanding the valve-way through which the air and water are expelled from a condensing steam engine when steam is blown through the engine.

Snig, a species of eel found in many parts of England, and known by the olive-green color of its back, the under parts being a golden yellow. The term, however, like that of "grig," is employed by fishermen in a vague and loose way.

Snipe, the common name of the birds composing the family *Scolopacidæ.* There are many genuses, of which the genus *Gallinago* may be taken as the type. The common snipe of Europe (*G. media*), is about 17 inches in entire length, the bill almost 3 inches. The general color of the upper parts is a blackish-brown, finely mixed with pale-brown and a rich buff-color; three pale-brown streaks along the head; the neck and breast pale-rust color mottled with black; the belly white. The tail consists of 14 feathers. The snipe, when flushed, changes its course several times in a zigzag manner in the air, and then darts off very swiftly, so that young sportsmen find it a very difficult bird to shoot. The snipe makes a very inartificial nest of a little dry herbage in a depression of the ground, or sometimes in a tuft of

grass or rushes. The eggs are four in number, pale-yellowish or greenish-white, the larger end spotted with brown. This species of snipe is plentiful in all the moory and marshy places throughout Europe, also in some parts of Asia, and it is found in the N. of Africa. The snipe is capable of being tamed, and becomes very familiar, but it is difficult to keep, from the prodigious quantity of worms and other sueh food whieh it requires. The common American snipe (*G. Wilsonii*) is about equal in size to the common snipe of Europe, and much resembles it also in plumage. The tail has 16 feathers. This speeies is abundant in summer in the N. parts of the United States and in Canada, in the more S. States in winter. It is much in request for the table, and is

COMMON SNIPE.

often caught in snares. The snipe is a very fat bird, but its fat does not cloy and very rarely disagrees even with the weakest stomaehs. It is mueh esteemed as a delicious and well-flavored dish.

Snizort, Loch, a large inlet of the sea in the N. W. of Skye, between Vaternish and Trotternish, picturesquely studded with islands in its upper part. Length 16 miles; greatest breadth about 9.

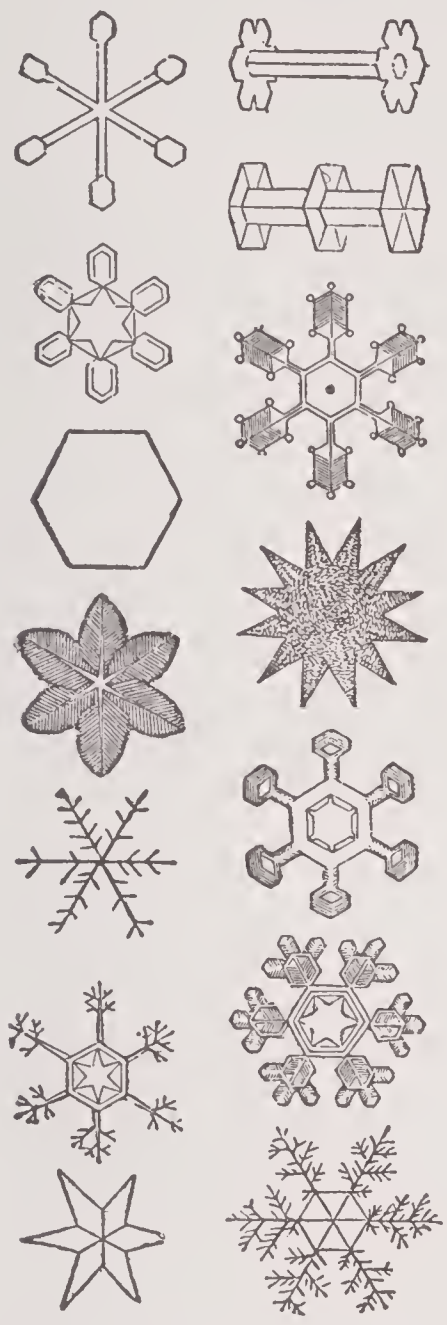
Snoilsky, Carl Johan Gustaf, Count (snoil'skē), a Swedish poet; born in Stockholm, Sweden, Sept. 8, 1841. His "Sonnets" (1871), and his translation of Goethe's ballads (1876), are among the best in Swedish literature. His later poems, "New Stanzas" (1881), show sympathy for the unfortunate and oppressed.

Snoring, an abnormal and noisy mode of respiration produced by deep insiprations and expirations through the nose and open mouth, the noise being caused by the vibrations of the soft palate and uvula. Sometimes the noise arises in the glottis, the vocal ehords vibrating loosely. Keeping the mouth shut will usually make snoring impracticable.

Snorri Sturlason, an Icelandic poet and historian; born in Hvami, in the Dala district of Iceland, in 1178; was the son of Sturla Thordsson, the founder of the powerful family of the Sturlungs. At three years of age he became a foster-son of Jon Loptsson, grandson of Sæmund, author of the "Elder Edda," then the most influential and gifted man in Iceland, and after his death (1197), Snorre remained at Odda with his son Sæmund, and by his marriage, first with Herdys (1199), and after her death with Hallveg Ormsdatter, gained great possessions, sometimes appearing at the Althing with a following of 800 to 900 men. Twice was he appointed "Laugmand" (1219–1223, and 1226–1236). In 1218 he traveled to Norway, where he gained great favor with Duke Skuli, returning to Iceland in 1220. In 1237 he was obliged to fly to Norway in consequence of a league formed against him by his brother Sighvat and his nephew Sturla. Here by his poetical powers he aided his patron Skuli in his war against King Hacon, but was in consequence, on his return to Iceland, pursued by the hatred of the king, and murdered through his influence by his sons-in-law at Reykholt, Sept. 22, 1241. Snorri was the last and one of the greatest of the Northern skalds. He wrote many panegyrics and heroic songs, and is believed to have been the author of part of the "Younger Edda." His principal work is the "Heimskringla" ("ring of the world"), a collection of sagas on the ancient history of Norway. It was translated into Danish by Claussen in 1559, but not published till 1697 by Peringskjold (Stockholm). The best edition is that published with a Danish translation by Schoning and Werlauff (Copenhagen 1777–1826). It was translated into English by Samuel Laing (Lond. 3 vols. 1844), and German translations of parts have been published by Wachter (2 vols. 1835–1837), and Mohnik (1835).

Snow, in meteorology, water solidified in stellate crystals, variously modified, and floating in the atmosphere. These crystals arise from the congelation of the minute vesicles which constitute the clouds, when the temperature of the latter is below zero. They are more regular when formed in a calm atmosphere. Their form may be investigated by collecting them on a black surface, and viewing them through a strong lens. The regularity, and at the same time variety, of their forms are truly beautiful. These crystals are united together in such a manner as to reflect light to the eye in great abundance from all, thus producing a sensation of whiteness. The presence of air in snow renders it opaque, otherwise it would be transparent, like ice and other crystallized bodies. Regular crystals of

snow are only found where the air is still and the temperature very cold; they do not, therefore, often occur in temperate regions. In the polar regions snow has been seen of red, orange, and salmon color. This phenomenon occurs both in the fixed and floating ice, and seems to result in some cases from vegetable, and in others from animal matter suspended in the water and deposited on the surrounding ice. In some cases snow storms have been known to present a luminous appearance, covering every object with a sheet of fire. In general, the electricity of snow is positive, and by chemical analysis it has been found that snow water contains a greater proportion of oxygen than rain or river water — a fact which accounts for its superior activity in causing iron to rust, etc.



SNOW CRYSTALS MAGNIFIED.

In the economy of nature snow answers many valuable purpose. By its gradual melting in high regions it serves to supply streams of running water which a sudden increase in the form of rain would convert into destructive torrents or standing pools. In many countries snow tempers the burning heat of summer by cooling the winds which pass over it. On the other hand, in colder climates snow serves as a defense against the severity of winter, where it protects plants against the frost and serves as a shelter to animals, which bury themselves in it. The elevation at which mountains are covered with perpetual snow is called the "snow line," or plane of perpetual snow. The snow line on the N. side of the Himalayan Mountains is 18,600 feet; on Chimborazo, 15,802 feet. The altitude of perpetual snow under the equator was fixed by Humboldt at 15,748 feet; toward the poles it is considerably lower. The snow line of the Alps, N. latitude 46°, is only 8,860 feet; and that of the Pyrenes about 8,850 feet. At the North Cape, in lat. 71°, it is only 2,300 feet. The position of the snow line in all mountains, however, depends so much on variable causes, such as the form of the summits, the comparative altitude, and other physical features of the surrounding country, the particular exposure of the mountains etc., that no general rule can be laid down for determining the altitude of perpetual snow.

Snow, a vessel equipped with two masts resembling the main and fore masts of a ship, and a third small mast, just abaft the main-mast, carrying a sail nearly similar to a ship's mizzen.

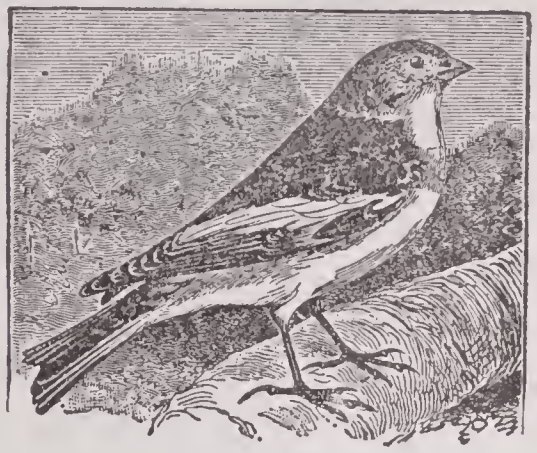
Snow, Lorenzo, a Mormon apostle; born in Mantua, O., April 3, 1814; was converted to Mormonism in 1836; became a missionary in 1837, and traveled in England and other countries; and on his return to the United States organized and captained the Nauvoo Legion, the body of Mormon troops in Illinois. He was a member of the Utah Legislature in 1852–1882; founded Brigham City, Utah; was ordained one of the Twelve Apostles of the Church in 1849, and succeeded Wilford Woodruff as president of the Mormon Church in 1838. He died in Salt Lake City, Utah, Oct. 10, 1901.

Snowball Tree, the garden variety of the *Viburnum opulus* (natural order *Caprifoliaceæ*) or guelder rose.

Snowberry, the *Symphoricarpos* or *Symphoria racemosa*, a bushy deciduous shrub of the natural order *Caprifoliaceæ*, a native of the N. parts of North America, and now very common in British shrubberies. It has simple leaves, small flowers, and white uneatable berries about the size of black currants, remaining on the bush after the leaves. The name is also given to *Gaultheria serpyllifolia*, a native of North American bogs.

Snowbird, the common name of the genus of birds *Junco*, family *Fringillidæ*, distinguished by their bill small and conical, the wings reaching the basal fourth of the exposed portion of the tail, and the tail slightly emarginate. The common snowbird or black snowbird, *Junco hyemalis*, of the United States E. of the Missouri, is 6¼ inches long; grayish or dark ashy black deepest before; the middle of the breast and belly, the under tail coverts, and the first and second external tail feathers white, and the third tail feather white margined with black. These birds appear in flocks in winter and are very tame. They are fond of grass-seeds and berries; the flesh is delicate and juicy, and is often sold in the New Orleans market.

Snow Bunting, *Plectrophanes nivalis,* an Arctic passerine bird, visiting more S. latitudes in the winter. It is about seven



SNOW BUNTING.

inches in length, and its plumage varies considerably at different seasons. In winter the upper part of the head, cheeks, and a band on the lower neck are light reddish-brown; lower parts white, upper parts black, edged with yellowish-brown, but varying much in individuals. In summer the head, neck, lower parts, and a patch on the wings are pure white, the rest of the plumage black. They feed on seeds and insects, and soon after their arrival in temperate regions become fat, and are then esteemed a delicacy. The Greenlanders kill them in great numbers and dry them for winter use. Their song is not unlike that of the lark, and when singing they perch near a mate; their call is a shrill piping note generally uttered on the wing.

Snowdon, a mountain range in North Wales; stretching N. N. E. to S. S. W. across Carnarvonshire from the mouth of the Conway to Tremadoc; length, about 24 miles; average breadth, 6 miles. It attains its greatest height in Snowdon proper, whose loftiest summit — Wyddva, 3,571 feet — is the culminating point of South Britain.

Snowdonia, the region around Mount Snowdon, Wales.

Snowdrop, a well-known garden plant of the genus *Galanthus; G. nivalis,* natural order *Amaryllidaceæ.* It bears solitary, drooping, and elegant white flowers, which appear early in spring. It is a native of the Alps, but is quite common in gardens in the Northern United States.

Snowdrop Tree (*Halesia tetraptera* and *H. diptera* a name of ornamental trees of the Southern United States with flowers like snowdrops, belonging to the styrax family.

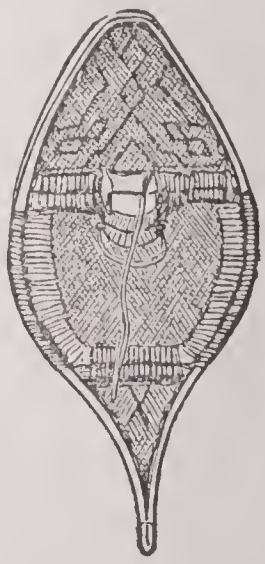
Snow Goose, in ornithology, the *Anser hyberboreus.* Color white, sometimes with more or less of a ferruginous tinge on the head; bill, feet, and orbits aurora-red. It obtains its snow-white plumage only at maturity. It breeds in large numbers in the barren grounds of Arctic America and migrates S. during the winter.

Snow House, a house or hut constructed of blocks of snow. Capt. Lyon thus describes some he saw in the Arctic regions: "Each dwelling might be averaged at 14 or 16 feet in diameter by 6 or 7 feet in height . . . The blocks of snow used in the building were from four to six inches in thickness, and about a couple of feet in length, carefully pared with a large knife . . . The building of a house was but the work of an hour or two, and a couple of men, one to cut the slabs and the other to lay them, were laborers sufficient."

Snow Line, in physical geography, the line of perpetual snow or congelation; the line above which snow does not melt, even in summer, but continues from age to age, unless it descends in glaciers. It is highest on the N. side of the Himalayas and the W. slope of the Andes, on both of which it is 18,600 feet high; on Mont Blanc it is 8,500 feet; at the North Cape 2,300 feet; and in Spitzenbergen, lat. 78° N., it falls to the sea-level.

Snow Plow, an implement used to clear a road or track of snow. It is of two kinds; one is adapted to be hauled by horses or oxen on a common highway, and the other to be placed in front of a locomotive. A variety of the latter is adapted for street railways. The simplest form for common highways consists of boards framed together so as to form a sharp angle, like the letter A in front, and spreading out behind to a greater or less width. Being drawn along with the apex in front, the snow is thrown off by the boards to the side of the road or path, and thus a free passage is opened for traffic.

Snowshoe, a light frame made of bent wood and interlacing thongs, used to give the wearer a broader base of support when walking on snow. The tread of the shoe is formed of strips of raw-hide, hard twisted twine, or, among the Indians, of deer-sinews In use the toe is placed beneath the strap and the foot rests on the thongs; as the heel rises in walking the snow shoe is not raised, but as the foot is lifted, the toe elevates the forward end of the snow shoe, which is then dragged along on the snow as the leg is advanced. They are usually from three to four feet in length, and a foot to 18 inches broad in the middle. See SKI.



SNOWSHOE.

Snowy Owl, in ornithology, the *Nyctea scandiaca,* a native of the N. of Europe and

America, visiting and breeding in the Orkney and Shetland Islands. In old birds the plumage is pure white, but in younger and adult birds each feather is tipped with dark brown or black. The length of the adult male is about 20 inches, that of the female four or five inches more. It flies by day and preys on the smaller mammalia and on various birds which it is able to capture.

Snowy River, a river of Australia, in New South Wales and Victoria; length, 240 miles, 160 of which are in New South Wales.

Snuff, a fragrant powdered preparation of tobacco inhaled through the nose. It is made by grinding, in conical mortars or "mills" worked by power, the chopped leaves and stalks of tobacco in which fermentation has been induced by moisture and warmth in closed rooms. There are numerous varieties. Some like the rappees are moist; others, for example the Irish and Welsh, are highly dried. A roasted Irish snuff called "Lundy Foot," or "Irish Blackguard," has wide repute for excellence. The mixture of different flavoring agents and delicate scents also gives rise to fanciful names for snuffs having exactly the same modes of preparation. French rappee is superior to all others, and its manufacture has been brought to high perfection at the French government factory. The tobacco is subjected to two processes of fermentation, whereby aroma and strength are acquired, and the nicotine and organic acids removed. The leaves and stalks, moistened with salt water (to prevent putrefaction), are pressed into cakes and sliced, and left in open chambers for five or six months to ferment and develop aroma. After that time the tobacco is ground in mills out of contact with air, in order to preserve the aroma, and the powder, *rapé sec*, is after damping conducted to closed wooden chambers to undergo during 10 months the second fermentation, which imparts strength to the snuff. Finally the snuff is gathered from the fermenting rooms into one large chamber, where it matures for one month; it is then ready for stamping into casks. The machinery used in the French factory is almost wholly automatic. Snuff is very commonly adulterated in order to increase its bulk or pungency. The consumption of snuff in the British Isles has been estimated to amount to 500 tons annually. The practice of snuff taking was introduced from America into France in the 16th century, and in the middle of the following century it was very general throughout Europe. The consumption of snuff greatly increased in England during the reigns of William and Anne, and snuff boxes of gold, silver, precious stones, and enamels were then not uncommon.

Snyder, Simon, an American military officer; born in Selin's Grove, Pa., Feb. 9, 1839; was appointed a 2d lieutentant in the 5th United States Infantry, April 26, 1861; was an aide-de-camp of General Couch during the Confederate raid into Maryland and Pennsylvania in 1864, and an acting aide to General Merritt in Sheridan's campaign. After the Civil War he served at various posts in the East and West till the outbreak of the American-Spanish War, when he was placed in command of the 1st Army Corps for service in Cuba. He was appointed governor of the province of Santa Clara, Cuba, Dec. 6, 1898, and later served on special duty at Ponce, Porto Rico. He was mustered out of the volunteer service, May 12, 1899, and ordered to the Philippines, where he commanded the United States troops in the district of Cebu. On his return to the United States he was appointed acting inspector of the Department of the Lakes on July 22, 1900.

Snyders, Frans, a Flemish painter; born in Antwerp Belgium, Nov. 11, 1579; he studied the rudiments of his art under Breughel and Van Baden. Later he visited Italy, but in 1609 finally took up his abode at Antwerp. Snyders, who is considered never to have been surpassed in his deliniation of dead game, fish, fruit, etc., excelled also in hunting scenes and combats of wild beasts. He used to work in concert with Rubens. Choice pieces of his are to be found in the collections at Munich, Vienna, and Dresden, in the Escurial, in the Louvre, and in some private English collections. He died in Antwerp, Aug. 19, 1657.

Soane, Sir John, an English architect; born in Reading, England, Sept. 10, 1753; studied at the Royal Academy, was sent to Rome for three years with the Academy pension of $300 a year, and on his return he was employed on many public works. In 1788 he was appointed architect to the Bank of England, and in 1791 clerk of works to St. James's Palace, the Parliament Houses, and other public buildings. In 1794 he drew up plans for the improvement of the House of Lords, but though they were accepted James Wyatt was engaged to carry them out. He became Professor of Architecture to the Royal Academy in 1806. He bequeathed his collection of works of art and $150,000 to the nation. The Soane Museum thus formed is housed at 13 Lincoln's Inn Fields, London, and contains antique sculptures, bronzes, gems, models of ancient buildings, a collection of pictures, etc. He died in London, Jan. 20, 1837.

Soap, strictly speaking, a salt consisting of a fatty acid in combination with a metallic base. In common parlance, however, the term is applied to the soluble salts formed by the union of the fatty acids with the al-

kalics. If oil and water be shaken together mechanical union will take place; but on allowing the mixture to rest, the oil will gradually separate and float on the surface of the water. If a small quantity of caustic soda or potash be added to the mixture, and it be then agitated, union will take place between the three bodies, a milky fluid being formed. If a sufficient quantity of alkali has been added, and the solution be boiled, it gradually becomes clear, giving rise to a soapy fluid, which froths strongly on agitation, presenting all the properties of a solution of soap. If to a portion of this clear liquid a strong solution of common salt is added, a peculiar curdling is produced. The liquid separates into a clear fluid, containing glycerin, while the curdy portion rises to the surface. This substance is the fatty acid of the oil, in combination with the alkali used and a certain proportion of water, and if pressed and dried, exhibits the properties of ordinary soap. Ordinary soap is freely soluble in both hot and cold water; but if any of the earths, such as lime, be present, an insoluble compound is immediately formed; or, in common language, the soap curdles, from the water being hard.

Ordinary soaps are of two kinds,—soft and hard. Soft soap is a combination of some fatty or oily substance with potash, and contains an excess of alkali; hence it is used for cleansing purposes where very highly detergent powers are required. The hard soaps are combinations of the fatty acids with soda; the principal varieties being yellow soap, made from tallow and palm oil, and containing a certain proportion of resin to give it lathering properties; curd soap, which is made from tallow, only a small portion of olive oil or lard being added, to give it softness; mottled soap, which is prepared from tallow, palm oil, and kitchen stuff, and contains a portion of insoluble iron soap giving it a marbled appearance. Marseilles and Castile soaps are made of olive oil and soda, a small quantity of sulphate of iron and sulphuretted lye being added to them while in a pasty condition. The object of marbling soap with an insoluble matter is to show that they contain but little moisture since, if too large a proportion of water were present, the coloring matter would sink to the bottom and remain there, instead of being diffused through the mass.

The manufacture of different soaps is very similar, differing only in minor details. An alkaline lye is first prepared in large iron boilers, called coppers, heated by steam, by boiling in them a mixture of soda ash, lime and water. After boiling for some time the steam is turned off and the lye is allowed to cool, carbonate of lime being deposited. The clear lye is then drawn off, weakened by the addition of water, and added to the tallow, fat, or oil in the proportion of 150 gallons of weak lye to one ton of fat. When ebullition takes place, stronger lyes are added by degrees till the soap feels no longer greasy. Common salt is then added, which separates the glycerin and other impurities derived from the grease. These are drawn off and thrown away, stronger lyes being added, and the boiling continued till the whole of the soap separates. It is then transferred to frames to cool, a small portion of the lye contained in the soap gradually separating and accumulating in the lower part of the frame. This portion is poured off and added to the next charge. When perfectly hard, which occurs in three or four days, the soap is cut up into bars with wires. Curd soap is generally remelted, and forcibly stirred or crushed to break up the grain. It is the purest commercial soap. Fancy soaps are made from pure curd soap, scented with various perfumes, and colored with a variety of tints to suit the prevailing fashion. Honey soap contains no honey. It is made of good yellow soap scented with oil of citronella. Real old brown Windsor soap is curd soap which has turned brown by age. It is now, however, made artificially by mixing caramel with white soap. Transparent soap is made by dissolving white soap in spirit and evaporating. Glycerin soap is prepared by heating the fat with alkali and a little water to about 400° F. for two or three hours, and running the mass at once into molds. It is, of course, a mixture of soap and glycerin. Besides being used for ordinary domestic purposes, soap is employed in various manufactures as a detergent for cleansing silk, wool, and the different fabrics made from them.

The United States stands at the head of all other countries in the use if not in the manufacture of soap. The average exportations of American soap in a year amount to 30,000,000 pounds. The importations into the United States of soap amount to 3,000,000 pounds, or one-tenth as much. There are nearly 500 soap factories in the United States, with a cash capital of over $58,000,000, using material to the value of $46,500,000 and yielding products valued at over $72,000,000. In the number of such establishments New York stands first among American cities. but prior to its enlargement Philadelphia had the first place. New York second, and Brooklyn third. Boston, San Francisco, and Cincinnati follow in the order named, and in respect of the value of materials used in soap making Chicago comes first, having many facilities for procuring them. See SOAP, TOILET.

Soap Berry, the name applied to the fruit of several species of the genus *Sapin-*

dus (natural order *Sapindaceæ*) from their rind containing a saponaceous principle, so that when mixed with water they produce an abundant lather. The fruit is globular, as large as a cherry, inclosing a nut of a shining black color when ripe.

Soap Bubbles. The blowing of soap bubbles is of great antiquity, and is to be seen depicted on an Etruscan vase in the Louvre. In their scientific aspect soap bubbles and soap films have been studied specially by Plateau, who, by adding glycerin in a certain proportion to the soap solution, obtained remarkably durable films and bubbles. The beautiful play of colors familiar to all is due to the excessive but variable thinness of the soap film. It is in fact an illustration of the interference phenomenon known as Newton's rings. If at any part the film becomes thin enough the black spot appears. If this black portion is touched the film is shattered at once, though it may in its thicker portions be pierced by a needle without losing continuity. The spherical form of the ordinary soap bubble is a direct result of the action of surface tension, the geometrical condition being that with given volume the surface must have minimum area. With soap films formed on frames of wire the same principle holds — for given boundary and given internal volume the area must be a minimum. Thus by a skillful arrangement of soap films we may make visible many highly interesting problems in pure mathematics.

Soap Plant, a name common to several plants used in place of soap, as the *Phalangium pomaridianum,* a Californian plant, whose bulb, when rubbed on wet clothes, raises a lather, its smell somewhat resembling that of new brown soap.

Soapstone, or **Steatite,** a hydrated silicate of magnesia, with a smooth greasy feel like that of soap, and so soft as to yield to the nail. It is a massive variety of talc, which, when pure and compact, is much used as a refractory material for lining furnaces, being infusible in any ordinary furnace heat. It is easily turned in the lathe, or cut with knives and saws, and is made into culinary vessels. When very strongly heated, soapstone loses the small portion of combined water which it contains and becomes harder and susceptible of polish. In this state it is made into jets for gas burners, which have the advantage of not being liable to rust or corrosion. When reduced to powder it is used like plumbago as a lubricator and to diminish friction, as well as to give a surface to some kinds of paper hangings.

So much soapstone is used in manufacturing establishments for various purposes, that the supply is not equal to the demand. Soapstone will not corrode, but remains always pure. It is composed of 62 per cent. silica and 34 of magnesia, two of the most durable substances known when exposed to the atmosphere or fire. It is practically without expansion, and a better radiator than any metal. Soapstone, as a finish or covering for walls or ceilings, is coming into use. It takes a high polish, is pearl-gray in tint, is said to possess the best possible surface for painting, either in oil or water colors, and, what is very desirable, will neither crack nor chip. It is claimed for it that it is a non-conductor and non-absorbent; that it can be washed without injury; nails can be driven into it without damage; when subjected to heat, moisture, and chemical fumes, it gives no smell and does not turn yellow with age, thus being especially adapted to churches, schools, hospitals, and hotels.

Soapstone is being given special attention as a pigment for protecting steel vessels against corrosion. Its latest application, however, is that of a paint for protecting the insides of iron and steel ships and other structures, which difficult problem this valuable material has been the means of solving. It is also used for preserving structures built of limestone and other stones liable to disintegrate under atmospheric influences. Soapstone as a paint being transparent when ground by itself, shows only the added color, thus forming a foundation on native woods before varnishing, as also a coating on polished steel and iron to preserve them from corrosion. It is suitable for all inside and outside work, and wherever materials are exposed to the variable changes of weather, owing to its waterproof merits, as also being a fireproof paint. This soapstone, in foundry facings, is far superior to the present commercial soapstone facings manufactured in Eastern cities. As it is free from grit it is especially desirable for hollow wares or other light castings requiring a superior finish, as it leaves the castings very smooth and of a bright appearance, as the metal will not run or burn at the time of pouring.

Soapstone manufactured into steatite grease or oil is a perfect lubricant, having a good body and entire freedom from any impurity, and is not affected by acids, steam, heat or cold, and is invaluable when there are "hot boxes." It is used in polishing marble and glass for mirrors; is especially adapted for a make-weight in soap and paper factories, and where adulteration is used, as it is not poisonous; and as a base for cosmetics in some points excels the best imported French talc, which commands a high figure. Soapstone for the manufacture of porcelain, Parian, China, Bohemian and other wares is claimed to be the best and cheapest material in the United States for such purposes. In China

it is used to form the household gods, hence it has been called the figure stone. When carefully manipulated it will make the handsomest articles by whatever name known, and will take the richest colors, either blue, crimson, or gold, and when retaining its own color a pure, transparent white.

Soapstone slabs are extensively used for manufacturing into laundry, bath and acid tubs, and in chemical laboratories, as also in the manufacture of different varieties of stoves, mantels, linings, heaters, caskets, assay furnaces, gas burners, and wherever acids are used or there is a necessity to retain heat, or where a fireproof article is necessary. As a material for firebricks — handsome, knife-edged, making close joints, free from expansion or contraction, and preserving the integrity of the furnace walls — it has no superior in the market. This soapstone is especially adapted for furnace linings where ores are reduced by fluxes and as a material for crucibles. In the manufacture of pressed bricks for buildings, this material has no equal, for it leaves a smooth, polished face, sharp edges, and can be manufactured in all colors from a cream to black, making a valuable brick for its lasting properties as well as for its highly ornamental finish. Manufactured into enameled brick it is a success; having the suction necessary to retain the enamel, it is equal to any material known, requiring but little enamel to cover surfaces. Pressed, molded and cast into any form, as terra cotta or other architectural work, there are but few materials which can be worked to such advantage and with such profits. Thus, this soapstone — remaining perfectly white after being worked in the finest wares and exposed to the greatest heat, enduring the highest temperature without fusing, at the same time acquiring a semi-vitreous texture and peculiar translucency and toughness, when enameled retaining a beautiful gloss in its own colors, giving a handsome finish to every article it is molded into, remaining strong, lasting, and free from checks — needs only skilled labor and machinery to establish a vast industry giving employment to thousands.

Tale, of which soapstone or steatite is a part, is a very common mineral and in small quantity it is widely distributed. It is commonly formed by the alteration of other magnesian minerals, and thus it is an almost constant associate with the peridotite and pyroxenite rocks, with serpentine, with many of the chlorite or talcose schists, and with dolomite. Most of the commercial deposits of talc have been formed from the alteration of other minerals in place. Among the commoner minerals from which it has been derived are enstatite, tremolite, actinolite, and pyroxene. The distinctively fibrous varieties of tale are generally pseudomorph after enstatite. Enstatite rocks, which are found more or less abundantly in the periodtite belt of the Southern Appalachian region, have been frequently altered into talcose rocks, some of which have formed extensive beds of soapstone which have been utilized in the construction of fireplaces, etc.

The large deposits of fibrous talc in St. Lawrence co., N. Y., have been shown to have resulted from the alteration of beds of enstatite and tremolite. The beds of talc have the same strike and dip as the crystalline limestone in which they lie. Their walls consist of a tremolite or enstatite schist, which passes gradually over into crystalline limestone. The large deposits of pure talc occurring in Swain and Cherokee counties, N. C., have been shown to have probably resulted from the alteration of original beds of tremolite, and they also correspond in strike and dip with the marble and quartzite adjacent to them.

Talc in considerable variety is found in nearly every State along the Atlantic slope, the deposits of the best quality being in New York and North Carolina. It is however mined in New Hampshire, Vermont, Massachusetts, New Jersey, Pennsylvania, Maryland, Virginia, Georgia, and California. Most of the talc mined in these latter States is of the soapstone variety, and little of it is used in the manufacture of "flour talc."

The following table shows the production of talc and soapstone by States in the calendar year 1908:

State.	Quantity. Short tons.	Value.
New York	70,739	$697,390
Virginia	19,616	458,252
Vermont	10,755	99,743
Other States	16,244	145,837
Total	117,354	$1,401,222

Soap Test, a test for determining the relative hardness of waters. It consists in adding to the different waters a solution of soap of known strength, until a permanent lather is produced on shaking.

Soap, Toilet. Owing to the different conditions of the oil market in Europe as compared with the United States, the raw materials for the soaps made there are somewhat differently regarded in Germany than here. Cocoanut oil and palmkernel oil largely predominate there, while wool fat, linseed oil, horse fat, and recovered greases are given special attention in connection with the many problems which confront the German manufacturer in regard to the proper procedure in the many soaps which he makes on a small scale. For it must be understood that there the number of large factories is exceedingly small in comparison to the num-

Soap, Toilet

ber of very small factories that make their boiled soaps in batches of 3,000 to 4,000 pounds or less, in a kettle heated by an open fire, and with hardly as much as an indistinct recollection of having heard that in some parts of the world soap is crutched by machinery. Besides the difference in the raw materials used mostly, and the small scale on which the German manufacturer generally operates, there is also the difference in climate as well as of usage and popular taste, which calls for one kind of soap in one country and for other kinds elsewhere; so, for instance, boiled-down soaps are used to a much greater extent in Europe than they are here, and again, as owing to their moist climate soaps dry less rapidly than they do here, such kinds are greatly made as would prove almost insoluble in our climate after storing for some time. Then, too, soft soaps are made in Germany in incredible quantities.

The following is a summary of Dr. Bering's detailed description of the process. It will be seen that in the matter of toilet soaps the difference between the countries is less marked. only that they make a much larger proportion of their toilet soaps by the cold process. The soaps turned out by our (the German) perfumers are made either directly or indirectly by remelting or by milling. In the two last named processes soda soaps are used which must be free from odor and perfectly neutral, must be easily melted on heating, and — in spite of greater solubility — must yield a more abundant and solid lather than the boiled soaps.

In the first named process the fats are melted at the lowest possible temperature, not above 65° R., and one-half of the lye to be used, at sp. gr. 1.33, is run in while stirring steadily; after one-half to one hour, according as the mass shows a tendency to become solid, the remaining lye is added, and when the mass appears to be perfectly homogeneous throughout, the color and perfume are stirred in. Now the soap is run into rather strong wooden frames which are covered inside with linen cloths of a close texture, and sufficiently large that the entire block of soap can be covered with them. The square forms consist of side pieces about 1½ to 2 feet long and 1 inch thick, and a bottom of the same thickness. The side pieces are provided with pegs that fit exactly into corresponding holes in the bottom and walls, so that they can be easily put up or taken apart. Iron braces resting in notches on the side pieces give the frames the necessary strength to hold the batch of soap of say 100 pounds. After framing the soap, the whole is covered with thick cloths in order to keep in the heat which develops. As soon as the soap has become solid the cloths are removed, the soap is allowed to get cold, the side pieces are then taken off and the linen cloth is removed. The soap is now ready for cutting and pressing, care being taken to warm the bars previously if they have become too hard, in order to avoid cracking. After pressing the cakes are trimmed in order to remove any unevenness on the edges.

The fats used are lard, tallow, cocoanut oil, palm oil, and less frequently almond oil. The lard and tallow must be previously purified, and especially the latter has to be freed of its disagreeable odor. In running the melted grease into the kettle it is passed through a cloth. The manner of adding the color depends on the nature of the latter, heavy, earthy, or metallic colors, such as umber or vermillion, being added only when the soap has acquired a thick consistency, while dissolved colors may be added while the soap is still thin. Very few colors only can be added before all the lye has been run in and saponification has begun. Aniline colors almost disappear at first under the action of the alkali, but return after cooling.

Marbling of the soap is done by stirring up the required color in melted cocoannt oil running it into a funnel closed at the lower end by a finger, and letting the contents run over the soap as it is run in layers into the frame. When the frame is full a stick is drawn in fancy figures through the soap to distribute the color.

Practice is the best teacher, not only in the use of different fats, whether cocoanut oil alone, or with tallow or lard, or with both, is to be employed, but also in deciding whether soda lye alone shall be used or potash lye added to it. Those who work intelligently will soon find which will bring them to the result they desire.

The second process, remelting, which is largely practised in England, consists in finely chipping the tallow soap procured from the soap maker, melting it over a very slow fire while steadily stirring, adding the perfume, mixing well, and framing. If a soap smells too strongly of tallow it may be purified by melting it over a very slow fire or in a water bath, together with one-third its weight of water, preferably rose water, and adding a small quantity of salt to separate the soap again; run it through a sieve as close as possible and let cool. Repeat if necessary.

In the matter of soap, of course, cheap goods are always wanted and the demand is supplied by incorporating more and more water in the soap. Cocoanut oil soap is especially adapted for this purpose, not only taking up considerable water itself, but communicating the same property to other fats. Such soaps, however, by the

evaporation of the water, soon lose their shape and appearance.

Soapwort (*Saponaria*), a genus of plants of the natural order *Caryophyllaceæ;* so called because the bruised leaves produce a lather like soap when agitated in the water. Common soapwort (*S. officinalis*) is a native of many parts of Europe, and is found

SOAPWORT.

on waysides, river banks, and thickets; in Great Britain it is found in alluvial meadows and under hedges. In the United States it grows by roadsides from New England to Georgia. It has handsome, pink-like flowers.

Soar, a river of England, which flows N. through Leicestershire, taking Leicester on its course, and joins the Trent about 12 miles E. S. E. of Derby, whence to Leicester it is navigable by barges.

Sobbing, a convulsive respiratory act, depending on nervous irritation, and caused by spasmodic movements of the diaphragm or midriff. The glottis is temporarily closed, and thus prevents entrance of air into the lungs in sobbing.

Sobranje, the national assembly of BULGARIA (*q. v.*).

Sobraon, a village in the district of Ferozpur, Punjab, British India, on the left bank of the Sutlej. It is celebrated for the battle fought here, Feb. 10, 1846, by Lord Gough, in which the Sikh entrenchments were stormed with great loss, and the enemy driven into the river. The loss of the Sikhs in killed, wounded, and drowned was 13,000. This victory terminated the first Sikh war.

Socage, or **Soccage,** in old law, a tenure by any certain and determinate service; being in this sense put in opposition to knight service where the render was precarious and uncertain, and to villeinage, where the service was of the meanest kind. These tenures are generally considered to be relics of Saxon liberty; retained by such persons as had neither forfeited their estates to the crown nor been obliged to exchange their tenure for the more honorable but at the same time more burdensome tenure of knight service. As, therefore, the distinguishing mark of socage is the having its renders or services ascertained, it includes all other methods of holding free lands by certain and invariable rents and duties; and, in particular, petit serjeanty, tenure in burgage, and gavelkind. Socage is distinguished as free and villein: Free socage (also called common or simple socage), where the service was not only certain but honorable, as by fealty and the payment of a small sum, in name of annual rent; villein socage, when the service, though certain, was of a baser nature. From this last tenure have sprung our present copyhold tenures.

Sociable. (1) An open carriage with seats facing each other, and thus convenient for conversation. (2) A species of tricycle. (3) A kind of seat with a curved S-shaped back, for two persons who sit partially facing each other. (4) A gathering of people for social purposes; a social party; an informal meeting.

Social Ascidians, in zoölogy, the family *Clavellinidæ.* The members are compound, each individual having its own heart, respiratory system, and organs of nutrition, but attached to stalks or bases, common to the group, through which the blood circulates in opposite directions.

Social Contract, or **Original Contract,** that imaginary bond of union which keeps mankind together, and which consists in a sense of mutual weakness and dependence. Jean Jacques Rousseau maintained that the natural and proper state of man is the savage state, when he possesses complete liberty, and that every social organization is an infraction of natural right. All men he believed are born equal, and society is founded on a social contract. His views on the subject prepared the way for the first French Revolution.

Social Democrats, an advanced body of socialists which is making advances in England and America. See SOCIALISTS.

Social Insects, the name applied generally to the species of bees, wasps, hornets, ants, white ants or termites, etc., which live in communities and evince in the order of their life a close analogy to societies of mankind.

Socialism, a term sometimes used in a very general sense to designate the theories and plans of those who, from the earliest times to the present, have advocated radical changes in our social and economic order, and have done so in modern times especially

Socialism

in the interests of the common man. Socialists have, however, always claimed that these changes would benefit society as a whole; and Plato advocated an aristocratic socialism, especially for the higher classes, though this, he claimed, would be in the interest of society as a whole, even of these lower orders who would be left outside the enjoyments of full socialism. But the tendency of socialism has been more and more to lay emphasis on the common man, till the wage earner has now become the central figure in socialistic theory and agitation. While socialism in the broad general sense has reference to most diverse changes of a radical sort in the social and economic order, in a narrower and more modern sense it means the theories and plans of those who would substitute public property in land and capital for private property in these instruments of production.

In earlier times socialism under the name of communism frequently opposed all private property, but modern socialism emphasizes private property in income. In the course of its evolution, socialistic thought has undergone changes in the view taken of social differences and classes. From Plato up to quite recent times socialism has been regarded as compatible with great distinctions in social rank. The French socialist Saint-Simon contemplated an army-like organization of society, with high officials like captains, majors, generals, and the Saint-Simonians thought it right that those holding the higher positions should receive higher remuneration than the masses, to correspond to the higher value of their services. Modern socialism, however, as a popular movement has become thoroughly democratic, looks with little favor on the idea of classes permanently set apart for rulership, and is inclined to favor equal incomes while allowing each one to use his income as he might see fit. COMMUNISM (*q. v.*) is an historical term which is now little used, having been replaced by socialism or collectivism, but all three have generally the same meaning.

Socialism, then, holds that the present system of industry which is carried on by private competing capitalists, served by competitive wage labor, must be superseded by a system of free associated workers utilizing a collective capital with a view to an equitable system of distribution. On this theory private property in land and capital will be abolished and the private receipt of rent and interest will cease. Incomes would be private as already stated and, moreover, all such moderate wealth as would be devoted, not to production, but to consumption might be regarded as at the free disposition of the owner. Socialism is the extension to industry and economics of the free self-governing principle recognized in democracy. It is industry of the people by the people for the people. The company or private corporation is at present the growing power in industry; but even as regards the great companies, the control of the State and of social opinion is continually extending. The great companies are no longer conducted by the owners of the capital as such, but by a paid staff of officials under a manager; and in the opinion of socialists the whole organization could without shock be transferred to the direct service of the community.

The claim of modern socialism to be distinctly a new movement rests on two great facts — the industrial revolution and the development of the modern democracy. Production is no longer carried on by the individual or family labor for local or family use. The wage earner has little control of the instruments of labor. Instead of working on his own account with his own small capital, he toils in large factories and other undertakings under employers who own and control the capital embarked in them. Industry is carried on by the united efforts of thousands of men, and is no longer an individual function, but a social and collective one. Socialists maintain that the energetic individualism which originated and established the industrial revolution has been superseded by the results of that revolution. Modern socialism, scientific socialism, so-called, believes in the coming of socialism as the result of economic evolution; and that earlier socialism which thought that artificial plans for a socialistic state could be elaborated in the mind of man and then introduced is contemptuously called Utopian socialism. The modern socialist claims that he can do no more than guide and direct great natural and social forces in their evolution.

The influence of socialism on social economic and political thought has been very great. Socialism has greatly helped to give prevalence to the historical conception of political economy. It has deepened and widened the ethical conception of political economy. It has taught that the entire technical and economic mechanism should be made subordinate to human well-being, and that moral interests should be supreme over the whole field of industrial and commercial activity. It inculcates an altruism unattainable by any probable development of human nature. It has given an exhaustive criticism of the existing society and of the prevalent economic theories. Almost every economic treatise now appearing bears the marks of socialistic criticism of the present society. Socialism has made a deep and abiding impression on the thought and activity of the world. Germany leads the way in the recognition of the influence of social-

istic theories, and this is particularly observable in socialism of the chair and in the State socialism which have played so great a rôle in recent German discussion and legislation. The socialists of the chair are an influential group of professional and other economists, whose position may be best described as illustrating the influence of the socialist movement in the above directions. They recognize the historical and ethical character of economics; and all of them make important concessions to the socialistic criticism of the existing society. Bismarck was the redoubtable antagonist of the social democracy, regarding it as subversive of Church and monarchy and fatherland, but he had considerable respect for socialistic principles, and he was prepared to hold the State responsible for its suffering members. The State socialism of Bismarck was an outcome of this sense of responsibility, and the same feeling has been emphatically expressed by the Emperor William II. Socialism does not desire a modification but a renovation of the existing industry, and through it of the existing society. Modern popular socialism is, as already stated, thoroughly democratic and opposes socialism of the chair and the State socialism of the ruling classes. It does not wish socialism without democracy. See COMMUNISM.

Socialists. The Socialist organizations of various countries are herein briefly reviewed:

United States.— The socialists of the United States are politically represented by the Socialist Labor Party, and by the Social Democratic Party. The National Convention of the Socialist Labor Party, held in New York city on July 9, 1896, adopted the following platform:

"With a view to immediate improvement in the condition of labor we present the following demands: Reduction of the hours of labor in proportion to the progress of production. The United States to obtain possession of the mines, railroads, canals, telegraphs, telephones and all other means of public transportation and communication; the employes to operate the same cooperatively under control of the Federal government and to elect their own superior officers, but no employe shall be discharged for political reasons. The municipalities to obtain possession of the local railroads, ferries, waterworks, gasworks, electric plants and all industries requiring municipal franchises; the employes to operate the same cooperatively under control of the municipal administration and to elect their own superior officers, but no employe shall be discharged for political reasons. The public lands to be declared inalienable, revocation of all land grants to corporations or individuals the conditions of which have not been complied with. The United States to have the exclusive right to issue money. Congressional legislation providing for the scientific management of forests and waterways, and prohibiting the waste of the natural resources of the country. Inventions to be free to all; the inventors to be remunerated by the nation. Progressive income tax and tax on inheritances; the smaller incomes to be exempt. School education of all children under 14 years of age to be compulsory, gratuitous and accessible to all by public assistance in meals, clothing, books, etc., where necessary. Repeal of all pauper, tramp, conspiracy and sumptuary laws. Unabridged right of combination. Prohibition of the employment of children of school age and the employment of female labor in occupations detrimental to health or morality. Abolition of the convict labor contract system. Employment of the unemployed by the public authorities (county, city, State, and nation). All wages to be paid in lawful money of the United States; equalization of women's wages with those of men where equal service is performed. Laws for the protection of life and limb in all occupations, and an efficient employers' liability law. The people to have the right to propose laws and to vote on all measures of importance, according to the referendum principle. Abolition of the veto power of the Executive (National, State and municipal), wherever it exists. Abolition of the United States Senate and all upper legislative chambers. Municipal self-government. Direct vote and secret ballots in all elections; universal and equal right of suffrage without regard to color, creed or sex; election days to be legal holidays; the principle of proportional representation to be introduced. All public officers to be subject to recall by their respective constituencies. Uniform civil and criminal law throughout the United States; administration of justice to be free of charge; abolition of capital punishment."

The party polled 39,759 votes in the presidential campaign of 1900. The Socialist Labor Party is organized in local organizations knowns as "sections," such sections existing in 32 States and two Territories. Any 10 persons in any city or town of the United States may form a section, providing they acknowledge the platform and constitution of the Socialist Labor Party and do not belong to any other political party. In places where no section exists, or where none can be formed, any person complying with the aforesaid provisions may become a member-at-large on application to the National Executive Committee. Sections are not permitted to charge initiation fees. All questions of importance arising within the party are decided by general vote. At each meeting of the section a chairman is elected, and the same rule holds good with all standing committees.

The Social Democratic Party, in national convention in Indianapolis, Ind., March 7, 1900, adopted the following declaration of principles:

(1) The organization of the working class into a political party to conquer the public powers now controlled by capitalists.

(2) The abolition of wage slavery by the establishment of a national system of cooperative industry, based on the social or common ownership of the means of production and distribution, to be administered by society in the common interest of all its members, and the complete emancipation of the socially useful classes from the domination of capitalism.

The working class and all those in sympathy with their historic mission to realize a higher civilization should sever connection with all capitalist and reform parties and unite with the Social Democratic party of America.

The control of political power by the Social Democratic party will be tantamount to the abolition of all class rule.

The solidarity of labor connecting the millions of class-conscious fellow workers throughout the civilized world will lead to international socialism, the brotherhood of man.

As steps in that direction, we make the following demands:

Socialists

(1) Revision of our federal Constitution, in order to remove the obstacles to complete control of government by the people irrespective of sex.
(2) The public ownership of all industries controlled by monopolies, trusts, and combines.
(3) The public ownership of all railroads, telegraphs, and telephones; all means of transportation and communication; all waterworks, gas and electrie plants, and other public utilities.
(4) The public ownership of all gold, silver, copper, lead, iron, coal, and other mines, and all oil and gas wells.
(5) The reduction of the hours of labor in proportion to the increasing facilities of production.
(6) The inauguration of a system of public works and improvements for the employment of the unemployed, the public credit to be utilized for that purpose.
(7) Useful inventions to be free, the inventor to be remunerated by the publie.
(8) Labor legislation to be national instead of local, and international when possible.
(9) National insurance of working people against accidents, lack of employment, and want in old age.
(10) Equal civil and political rights for men and women, and the abolition of all laws discriminating against women.
(11) The adoption of the initiative and referendum, proportional representation, and the right of reeall of representatives by the voters.
(12) Abolition of war and the introduetion of international arbitration.

In the presidential campaign of 1900 the Social Democratic Party polled 86,686 votes.

England.— The English societies representative of socialism are: the Social Democratic Federation; the Fabian Society and the Independent Labor Party, the last formed at a conference held in Bradford early in 1893, and attended by delegates from various Independent Labor organizations already formed, from branches of the Social Democratic Federation and from the Fabian Society. The object of the party is the realization of an industrial commonwealth founded on the socialization of land and capital.

"The true objeet of industry being the production of the requirements of life, the responsibility should rest with the community collectively. Therefore the land, being the storehouse of all the neeessaries of life, should be declared and treated as public property; the capital necessary for industrial operations should be owned and used collectively. Work and the wealth resulting therefrom should be equitably distributed over the population. As a means to this end we demand the enactment of the following measures:: (1) A maximum eight-hour working day and a six-day week, with the retention of all the existing holidays, and Labor Day, May 1, seeured by law. (2) The provision of work to all capable adult applieants at recognized trade union rates, with a statutory minimum of 6d. per hour. In order to remuneratively employ the applieants, parish, distriet, borough, and county counеils to be invested with powers to (a) organize and undertake sueh industries as they may consider desirable; (b) compulsorily acquire land, purchase, ereet, or manufacture buildings, machinery, stock, or other artieles for carrying on sueh industries; (c) levy rates on the rental values of the distriet and borrow money on the security of such rates for any of the above purposes. (3) State pensions for every person over 50 years of age, and adequate provision for all widows, orphans, sick and disabled workers. (4) Free maintenance of children while at school or university; free primary, seeondary, and university seeular education. (5) The raising of the age of child labor with a view to its ultimate abolition. (6) Abolition of indirect taxation, and the gradual transference of all public burdens on to unearned incomes, with a view to their ultimate extinction; municipalization and popular control of the liquor traffic. The Independent Labor party is in favor of every proposal for extending electoral rights to both men and women and democratizing the system of government."

The political creed of the party is summed up in the single sentence,

"The Independent Labor party is in favor of every proposal for extending electoral rights to both men and women and democratizing the system of government."

Stringent regulations have been drawn up for the guidance of candidates elected to the House of Commons, and also to guard the movement against being financed in the interests of any other party. Over the greater part of Lancashire and in other parts of the country branches have for part of their constitution a clause prohibiting members from voting for any candidate put forward by the Liberal, Liberal Unionist, or Conservative Parties. The organization claims to have over 200 branches and 12,000 members. Socialism has achieved great conquests in Australia.

Germany.— The socialists of Germany are known as the Social Democrats, and are led by Herren Liebknecht, Bebel, Vollmar, and Singer. They form the strongest political party in the empire, and their aim is avowedly to replace the existing capitalistic order of society by one in which land, capital, and all the means of production and distribution will be owned and worked by the community for the benefit of all its members. They polled 2,120,000 votes, 30 per cent. of the total votes recorded, at the 1898 general election, and secured the return of 56 members to the Reichstag. The number of party organs is 76, 22 of which are dailies. They denounce the so-called State socialism as a system of half-measures dictated by fear, and aimed merely at undermining the hold of the Social Democracy over the working classes by means of petty concessions and palliatives. State socialism, they say, is conservative; Social Democracy essentially revolutionary. Therefore the two are irreconcilably opposed.

France.— French socialists are organized into at least four distinct bodies. The first of these is called the Workmen's party, and is led by M. Jules Guesde, who is an ardent follower of Marxist and collectivist theories. It took its rise from the National Workmen's Congress at Marseilles in 1879, and its programme is "the political and economical expropriation of the capitalist bourgeoise and the socialization of all the forces of production." In 1896 at the Lille Congress this was put a little differently, thus: "The abolition of the capitalist system by means of the conquest of political power by the proletariat, the substitution of social for capitalist property, and the international agreement of working men." It rec-

ognizes no national obligations that would interfere with its objects, and is at one with most of the Socialists on the Continent. It claims to include 450 associations, with about 300,000 members, and its strength has been proved in municipal and parliamentary elections. M. Paul Lafargue is one of the leaders of the party, which controls about a score of papers. The Possibilist party derives its numbers almost entirely from Paris, and is practically a segment of the Workmen's party, from which it separated in 1882. The Blanquist party is also a Parisian society, and derives its title from the old revolutionist Blanqui. It professes itself "atheist, materialist, transformist, republican, revolutionist, communist, and finally internationalist." Its organ is the "Parli Socialiste," and its members call themselves communists, as a distinctive title from the collectivist Workmen's party. MM. Vaillant and Baudin are the most prominent of the members, of whom there are about 10,000. The Socialist Republican Party consists of radicals who have evolved into socialists. MM. Millerand and Goblet are its most prominent members, and its organ is the "Petite Republique" (Little Republic).

Austria.— In Austria the socialist party is strongly organized. There is a powerful propaganda carried on through the press, and the influence of the party is very marked in the elections. In Bohemia and Silesia the movement has made great way, but not so much in the Alpine districts. The party is split up into two sections — one led by Dr. Adler, with the "Gleichheit" (Equality) as its special organ and the theories of Karl Marx as its creed; and the other led by Herr Hanser, with the "Volkspresse" (People's Press) as its organ. It should be said that a great incentive to the spread of socialism is the sense of oppression and the determination to improve the material condition which exists in all parts of the empire. Therefore socialism in Austria is very much of a political force rather than a theoretical adherence to communistic principles.

Belgium.— The grant of universal suffrage in Belgium brought the socialists of the country into great and unexpected prominence at the general elections in October, 1894. No less than 29 socialists and radical candidates were returned, and between them and the Clericals the moderate Liberals and the Progressionists were almost annihilated. The socialist victories were won chiefly among the Walloons. The socialists have since more than maintained their ground in spite of the efforts directed against them by the Clericals.

Denmark.— Socialism in Denmark is of the Marxist order; but here again, as in Austria, political discontent has driven many to join the Social Democratic Federation. These form the moderate section, and tend to join the radicals, the extreme revolutionary section being very small in numbers.

Sweden and Norway.— The socialist movement has made little impression on these countries, but the party in Norway numbers about 56 unions, with a total membership of 6,000. Its avowed aims are to abolish the private ownership of land and of the instruments of production. In the towns of Sweden the movement has made some little headway, but it languishes for lack of funds. A tacit alliance existed between the socialists and the radicals of Norway during the general election of 1894, and Dr. Brunchorst, the first socialist to enter Parliament, was returned for one of the four seats at Bergen.

Netherlands.— The Socialist Revolutionary party is the leading body in this country. By a decree of the Cour de Cassation the Socialist League was dissolved in 1894 as an illegal association; but 52 branches of it united to form the new body. An official organ was established in 1895 with M. Domela-Nieuwenhuis as editor.

Russia.— The socialistic movement in Russia has been exceptionally active, but its numbers have been small, and it has aimed rather at political than at economic changes.

The growth of political socialism is shown by the following statistics of the vote cast by the Socialist Labor Party in different countries:

France.		Germany.	
1885	30,000	1867	30,000
1893	590,000	1877	468,843
1898	1,000,000	1884	599,990
Belgium.		1890	1,427,298
1894	334,500	1893	1,786,738
1898	534,324	1898	2,125,000
Denmark.		**Italy.**	
1872	315	1893	20,000
1887	8,408	1897	134,496
1890.....	17,232	**Great Britain.**	
1895.....	25,019	1895	55,000
Austria.		**Switzerland.**	
1895	90,000	1890	13,500
1897	750,000	1896	36,468

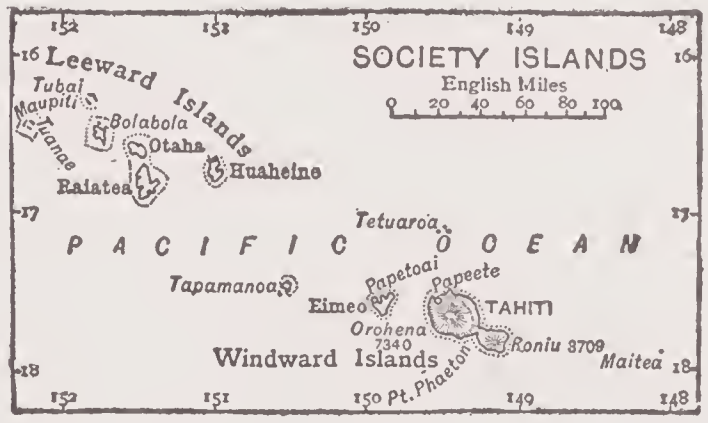
Social Science, the systematic investigation of questions relating to public and domestic hygiene, education, labor, the punishment and reformation of criminals, the prevention of pauperism, and the like. The "Sociétés de Bienfaisance" (Beneficent Societies), established in France in the 18th century, were founded for the purpose of discussing similar matters, and the National Association for the Promotion of Social Science originated in a meeting, in 1857 at the house of Lord Brougham (1778–1868), when he was appointed the first president. The association held annual meetings, and published its proceedings, classed under the heads of Jurisprudence, Education, Punishment and Reformation,

Public Health, Social Economy, and Trade and International Law, but its action was temporarily suspended in 1886. Since its establishment social science has made great advances in most civilized countries, notably in precautions against disease, the reconstitution of hospital charities, the regulation of prisons and workhouses, the establishment of reformatories for young criminals and penitentiaries for fallen women, and the extension of middle-class and industrial education. The word has also been used to designate the science now termed SOCIOLOGY (*q. v.*).

Social Science Association. See SOCIAL SCIENCE: SOCIOLOGY.

Social War, the name of a noted struggle in Roman history. M. Livius Drusus proposed a law for investing the Italian allies with the privileges of Roman citizens; but it was strongly opposed by the senators, the knights, and the people, and Drusus was assassinated 91 B. C. The Marsi, who took the lead (whence the name Marsian or Marsic, also given to that war), the Peligni, the Samnites, the Lucani, and almost every nation in Italy except the Latins, Tuscans, and Umbrians, revolted and established a republic in opposition to that of Rome. In the first campaign the Romans met with some severe losses. Nola was taken by the Samnites; the consul, P. Rutilius, and his lieutenant, Q. Cæpio, were defeated and slain, and many cities were captured. On the other hand Sylla and Marius obtained a great victory over the Marsi, and L. Cæsar defeated the Samnites. In the second campaign, 90 B. C., the Romans defeated the Marsi and induced them, together with the Vestini, Peligni, and Marrucini, to make a separate peace. Sulla, the Roman general, destroyed the town of Staliæ, defeated a large army near Nola, reduced the Hirpini to subjection, and defeated the Samians. The Romans were induced, hearing that Mithridates VI., King of Pontus, intended to aid the allies, to adopt measures of conciliation, and one state after another submitted and received the gift of Roman citizenship. After the close of this campaign the war dwindled away till it was brought to a conclusion, 88 B. C., by the remainder of the Italian states receiving the concessions they required. During this war, called the Social War, 300,000 men were slain.

Society Islands, an archipelago in the South Pacific, lying between lat. 16°–18° S., and lon. 148°–155° W. There are 13 principal islands, besides numerous islets, and the total area of the group is estimated at 734 square miles, with a pop. of about 16,000. The chief islands are TAHITI (*q. v.*), Eimeo, Huahine, Raiata, Tahaa and Bora-Bora. The Society Islands are of basaltic formation and abound in lofty and precipitous mountains usually fringed by a belt of flat land. Two peaks in Tahiti are respectively 7,000 and 8,700 feet high. Coral reefs are very abundant round all the islands. The soil being extremely fertile and water plentiful, the vegetation of the islands is most luxuriant. The climate is healthy, but enervating, and terrible hurricanes occur from time to time. The inhabitants belong to the Polynesian race and are handsome, brave, and intelligent, but indolent, fickle, immoral, and passionately fond of ardent spirits. On account of their indolence Chinese and Hervey Islanders are imported to work the cotton plantations. The people of Huahine, however, are enterprising traders, and their flag is seen as far

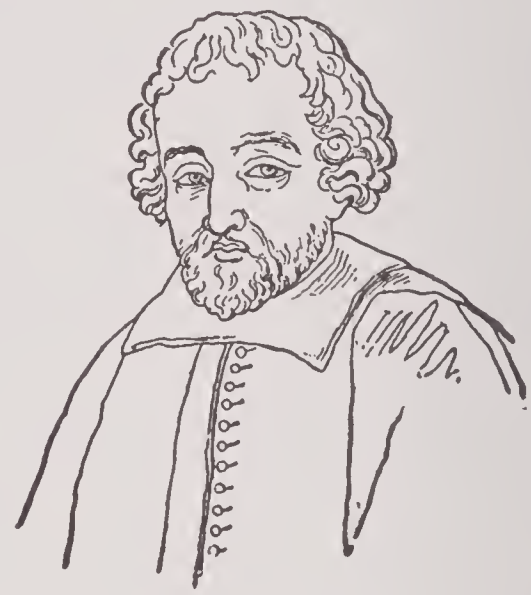


away as San Francisco. The chief exports from the islands are cotton, cocoanut oil, copra, pearl shell, and oranges. The Society Islands were discovered by De Quiros in 1606, but were first made known to the world by Cook, who visited them in 1769, and named them after the Royal Society, at whose recommendation the expedition which he commanded was fitted out. They have been the scene of missionary labors since 1797, and have for many years been entirely Christian. Taking advantage of a quarrel between the Protestant and Roman Catholic missionaries, the French espoused the cause of the latter, who were the last in the field, and seized the islands in 1844. In 1847 they were expelled by the natives from Huahine, Raiatea, and Bora-Bora, which, with small dependencies, were again ruled by their own sovereigns. Over the remainder of the group the French exercise a protectorate tantamount to possession. The nominal sovereign, Pomare, Queen of Tahiti, died Sept. 17, 1877.

Society for Psychical Research, a society founded in England in 1882 under the presidency of Prof. H. Sedgwick, of Cambridge University, for the purpose of "making an organized attempt to investigate that large group of debatable phenomena designated by such terms as mesmeric, psychical, and spiritualistic." Six committees were appointed to examine (1) the nature and extent of any influence which may

be exerted by one mind on another otherwise than through the recognized sensory channels; (2) hypnotism and mesmerism; (3) obscure relations between living organisms and electric and magnetic forces; (4) haunted houses and ghosts; (5) spiritualism; (6) for the collection of existing evidence in connection with these subjects, and especially in connection with apparitions at the moment of death, or otherwise. A special committee was also appointed in 1885 to investigate the remarkable occurrences which the Theosophical Society claimed to have witnessed. All these committees, however, were subsequently dissolved, and experimental investigation and the collection of evidence left in the hands of individual members, the results of their inquiries to be embodied in papers and read before the society, and also, if they desire, to be published by them. The society has published reports containing papers on thought reading, on mesmerism, on apparitions and haunted houses, and on many other similar subjects. It has a membership of more than 900, with a branch in the United States with more than 500 members and associates; publishes monthly "Proceedings"; and has already gathered quite a large library of works in various languages, all bearing on topics of a more or less mysterious character. Articles on various subjects have also been contributed by members of the society to various magazines. All that the "investigations" have done has been to bring together a mass of so-called evidence in the form of testimony from persons who claim to have seen or experienced something abnormal or out of the common way. No attempt has been made to sift the evidence as a whole, or to follow up any single instance brought forward, to ascertain whether the supernatural character of the appearance or experience has any foundation outside of the imagination of the person reconnting it. There is much evidence, often accepted by the unthinking as valuable, which is yet of such intrinsically worthless character that a ton of it would not weigh more than an ounce, to speak metaphorically. The society, therefore, has acted wisely in venturing with the publication of their collected "evidences" very few deductions therefrom.

Socinus, the Latinized name of two celebrated theologians, uncle and nephew, who have given their name to a religious sect, the Socinians, whose modified doctrines are now known as Unitarianism. . Laelius Socinus (Lelio Sozzini), born in 1525 at Siena, in Tuscany, and destined for the legal profession, abandoned jurisprudence for the study of the Scriptures. In 1546 he was admitted a member of a secret society at Vicenza, formed for the discussion of religious questions, which arrived at the conclusion that the doctrine of the Trinity was untenable, and that many of the dogmas of the Roman Catholic Church were repugnant to reason. The nature of their deliberations having become known the society was broken up, several of its members put to death, and others, among whom was Socinus, fled the country. He visited France, England, Holland, etc., and resided for some time in Poland, where he found many persons who were in sympathy with his views. He died in Zürich in 1562. He was the author of "Dialogue between Calvin and the Vatican," "The Sacraments," "The Resurrection of the Body," and several unfinished works. Faustus Socinus (Fausto Sozzini), a nephew of the preceding; born in Siena in 1539, was obliged to leave that town in his 20th year on account of his heretical notions. On the death of his uncle



LAELIUS SOCINUS.

he came into possession of the manuscripts of the latter, by the study of which he found his former opinions confirmed. He began to publish his views at Florence (where he lived 12 years at the court of the grand-duke, Francesco de' Medici) in anonymous writings, but afterward retired to Basel to escape the Inquisition. His opinions were still more fully developed during a residence in Transylvania, and in Poland he had numerous adherents. His death took place in 1604. See Unitarians.

Sociology, the science of the evolution and constitution of human society. It has for its subject the origin, organization, and development of human society and culture especially on the side of social and political institutions. Sociology embraces all social phenomena under their statical and dynamical aspects. It is the study of the conditions of existence and permanence of the social state; social dynamics studies the laws which govern the evolution of society. The field of Anthropology (*q. v.*) is usually restricted to the discussion of the earlier

stages of social development and survivals from that stage into the present. It is claimed for Comte that he created the science of sociology, but according to Mill he only rendered such a science possible. Lewes points out that Macchiavelli, Montesquieu, Adam Smith, and Benthan had a full conviction that social phenomena conformed to invariable laws, but that it was reserved for Comte to bring them under his "law of the three stages," and to show that all societies pass through a theological, a metaphysical, and a positive stage.

The methods of modern sociology are especially identified with the work of Herbert Spencer, who makes the science a series of generalizations on the correspondences and contrasts between individual organisms and communities or societies as social organisms, with their structures and functions, their periods of growth and decay. The forms of government — civil, ecclesiastical, military, industrial, ceremonial — are the structures of communities; sentiments, ideas, industrial processes, fine arts may be regarded as functions. From the psychical point of view Spencer's explanation of society is more scientific than Comte's, for Comte used the name more in the sense of the social order.

Spencer's elaborate analysis between the social and the biological "organism" has however in recent years lost prestige, especially through the rise of the "psychological" school of sociologists. The founder is M. Tarde, who likens society not to an organism but to a "brain." Its laws conform to the universal law of "repetition" which in physics is "oscillation," in biology is "reproduction," in society is "imitation." Professor Giddings has combined the views of Spencer and Tarde and has reached a higher form of statement than either. According to him the elements of society are included under the term population, the different aspects of which are reproduction, increase, density, emigration, the mingling of nationalities under the conditions of sympathy, antagonism, habits and traits of character. The social mind projects itself and finds its outward realization in external organization, two-fold in form, one division of which might be called the social composition, which includes the family, the horde, the tribe, the town, country, the commonwealth and the nation. The other form is the social constitution which is based on division of labor, consisting of economic, political, and cultural activities. The social mind tends toward the establishment of a natural equilibrium; faiths, values, traditions, standards, exist only in the individual mind, and, as the social mind consists of individual minds each playing on the other, and usually acting together, the social mind is sympathetically affected; consequently society is at times religious, artistic, or scientific. It is something more than a multitude of individual minds; it is a psychological body of sensitive organisms, having for its aim the protection and perfecting of its life, and the evolution of the spiritual and rational personality of its members. Institutions are the associations and relationships sanctioned by society, with the view to culture or protection.

Both Spencer's and Giddings' views of sociology are negative in that they make human society the play of unconscious forces. Lester F. Ward has developed a "dynamic" or "positive" theory which exalts in higher degree the conscious constructive power of organized society as seen in legislation. In this report he returns to Comte's view, though on a higher plane and with a recognition of psychology. From Ward's standpoint jurisprudence becomes the superior social science and it remains for that science to add its contribution to an all-round "sociology." Since the appearance of Tarde's work in 1889 the science of psychology has become strikingly a "social psychology" and the work in that field in recent years by Royce, Baldwin, Dewey, and others is an important contribution to sociology. The "moral" sociologists, represented by Green, Mackenzie, and Bosanquet, show rather the influence of sociology on ethics than that of ethics on sociology.

In Great Britain the name of sociology has been given to the study of all that relates to the social improvement of the community. A society called "The National Association for the Promotion of Social Science" was organized at a meeting held under Lord Brougham's auspices in July, 1857, to consider the best means of uniting together all those interested in social improvement; and till 1884 held annual congresses in large towns throughout the United Kingdom. At the last congress the Association comprised five sections — (1) Jurisprudence and Amendment of the Law (sub-section, Repression of Crime); (2) Education; (3) Health; (4) Economy and Trade; (5) Art. The American Social Science Association is similar to the British, dates from 1866; and has published 20 volumes of "Transactions."

Sock (Latin, *soccus*), a low shoe or slipper worn by the Greeks, and also by the Roman women, who had them highly ornamented. They were likewise worn by comic actors, the buskin, or cothurnus, being used in tragedy; hence sock and buskin are used figuratively as equivalent to comedy and tragedy.

Socotra, an island in the Indian Ocean, 150 miles E. by N. from Cape Guardafui, and 220 from the S. coast of Arabia; 70 miles long by 20 broad; area, 1,380 square miles. The interior embraces numerous

barren plateaus (1,500 to 2,000 feet), with several well-wooded mountains rising to 4,500 feet; there are fertile valleys between the ranges and belts of rich soil along the coasts. The climate is moist and warm, but healthy. Aloes and dragon's blood are the chief commercial products. The inhabitants, about 10,000 in all, live on dates and the produce of their sheep, goats and cows. They belong to two distinct types — one with a comparatively light-colored skin and straight hair, the other darker with curly hair. But all alike speak the same peculiar language, which has certain affinities with the South Arabian dialect of Mahra. The people show traces of intermixture with Negro, Arab, and Indian tribes; and in ancient times the inhabitants of Socotra were believed to have been acquainted with Greek civilization and later to have been Nestorian Christians. From the 16th century at least they owed some sort of allegiance to the Sultan of Keshin on the Arabian coast. After being occupied by Great Britain in 1835–1839, the island was taken under British protection in 1876 and formally annexed in 1886. The chief town is Tamarida on the N. coast. The Royal Society and the British Association sent out in 1880 a commission of scientific men to investigate the botany and zoölogy of the island; and a German expedition (Drs. Riebeck, Schweinfurth, and others) followed them the year after.

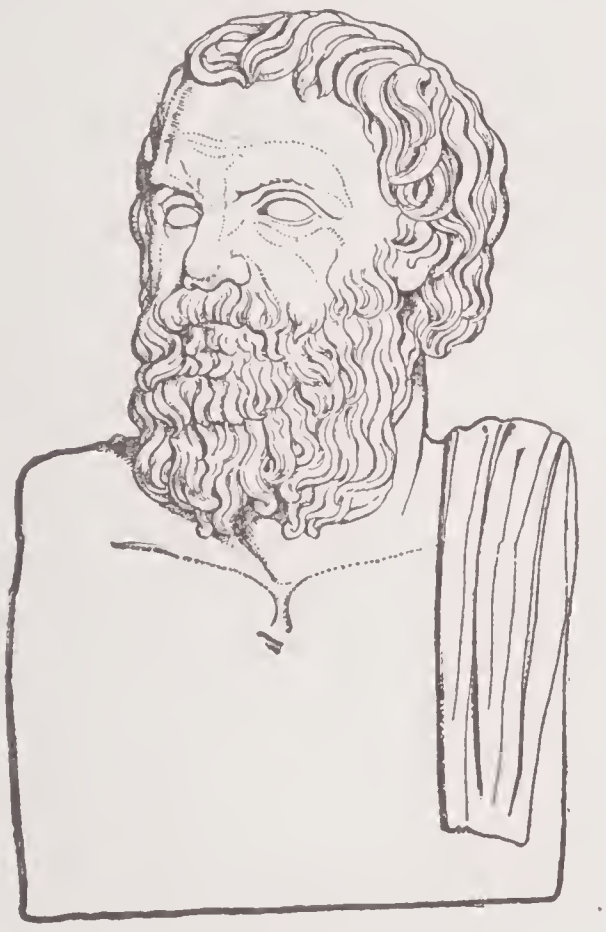
Socotrine Aloe, the *Aloe socotrina*. It has sword-shaped serrate leaves, one and a half to two feet long, with their apex sharp; flowers red, tipped with green, on peduncles rising from among the leaves, which are often aggregated round the tip of the stem. It is about three or four feet high, is a native of Southern Africa as well as of Socotra, but is now cultivated in the West Indies.

Socrates, a great Athenian philosopher, the son of Sophroniscus and Phænarete; born near Athens in 469 B. C. He was brought up to his father's calling, that of a sculptor, and for a time gained his living by it. He was, however, naturally an eager student, and by means of the best teachers and the best works accessible to him got the best education his country and his age could give him. He was one of the disciples of the great Anaxagoras and of his successor Archelaus, and soon gave himself up entirely to philosophy. He led an active social life, married — unhappily for himself, Xantippe — served his country as a soldier, distinguished himself by his courage and extraordinary endurance at the siege of Potidæa, at the battle of Delium, and at Amphipolis. At Potidæa he saved the life of his pupil Alcibiades, and at Delium the life of his pupil Xenophon. His robust constitution made him indifferent to the extremes of temperature; he could dress alike and go barefoot all the year round. He appears to have scarcely ever held any political office and seems to have inclined rather to the aristocratic than the democratic party. Critias, one of the Thirty Tyrants, had been his pupil; Theramenes was his friend; so was Charmides. Yet he fearlessly rebuked Critias for his vices, and thereby made him his enemy; and he with equal courage and disregard of consequences denounced the proceedings of the Thirty, and in one important case refused to obey their command. On the trial of the six generals after the battle of Arginusæ he firmly opposed the injustice of the sentence.

It was, however, as a teacher that Socrates made himself the foremost man of Athens and perhaps of the ancient world. He wrote no book, he did not establish a school or constitute a system of philosophy. But he almost lived abroad, and mixed with men familiarly, and in the street or any place of public resort, where listeners gathered round him, he talked and questioned and discussed, not for pay, but from the love of truth and a sense of duty. He was persuaded that he had a high religious mission to fulfill, and that a divine voice (afterward spoken of as his *Dæmon* or *Genius*), habitually interfered to restrain him from certain actions; and instead of encouraging profitless speculations on nature or the rhetorical charlatanry of the Sophists, he turned the thoughts of men to themselves, their actions, and their duties. Socrates was distinguished chiefly by his theory of virtue. Virtue, he said, consisted in knowledge. To do right was the only road to happiness; and as every man sought to be happy, vice could arise only from ignorance or mistake as to the means; hence the proper corrective was an enlarged teaching of the consequences of actions. Yet even on these things he did not dogmatize; instead of asserting and imparting, he questioned, and suggested, and showed, and led the way to real knowledge. He ruthlessly compelled ignorance and pretense to own themselves, and thus drew on himself the hatred of many.

So early as 424 B. C. he was attacked by Aristophanes, in his comedy of the "Clouds" as the arch-sophist, the enemy of religion, and corrupter of youth; substantially the same charges as those on which he was prosecuted 20 years later. He was made to appear not only hateful but ridiculous — a result the more easy to be attained because of his singularly ugly physiognomy, so easily rendered by the comic mask. He was persecuted during the tyranny of the Thirty, and after their fall he was impeached by Anytus, one of their leading opponents, with whom were asso-

ciated Melitus, a tragic poet, and Lycon, an orator. He was charged with not believing in the gods which the State worshiped; with introducing new divinities; and with corrupting the youth. Death was proposed as the penalty. Socrates refused to make use of a speech prepared for his defense by Lysias, and defended himself in a tone of confident innocence and worthiness which aggravated the ill-will of his judges. He was condemned by a majority of six only; but his additional speech in mitigation of the sentence raised the majority against him to 80. Thirty days elapsed between his sentence and its execution, in pursuance of the law that no criminal must be put to death during the voyage of the sacred ship, the "Theoris" to Delos with the annual offerings. During that period Socrates had the society of his friends and conversed with



SOCRATES.

them as usual; the last conversation being on the immortality of the soul. He refused the offer of some of his friends to procure means of escape for him; drank the hemlock cup with perfect composure, and so died in the 70th year of his age in 399 B. C.

Socrates opened a new era in philosophy, and without founding a system he originated, by rousing men to reflection and leading them toward self-knowledge, a vast movement of intellect which produced, first Platonism and the Aristotelian logic, and then all the systems, even conflicting ones, which rose into more or less importance during 10 successive centuries. So true, on a wider scale than he meant, was his own conception of his method as an "intellectual obstetricism." By his religious spirit, his belief in God and in immortality, his aim to reunite religion and immortality, and his own noble and beautiful life, the mirror of the truths he taught, he exerted so strong and wholesome an influence that the historian of the Christian religion, Neander, does not hesitate to adopt the saying of the Florentine philosopher, Marsilio Ficino, that Socrates, like John the Baptist, was a forerunner of Christ. Our primary authorities for the life and teaching of this extraordinary man are Xenophon's "Memorabilia and Apology of Socrates," and Plato's "Dialogues," in which he forms the great central figure.

Soda, the protoxide of the alkaline metal sodium. It may be procured in an anhydrous state by burning the metal in dry air or oxygen. It is of a white color, greedily abstracting water from the air, which cannot be expelled by heat. In this state it forms hydrate of soda, or caustic soda. It is so similar in its properties to hydrate of potash that it need not be fully described here.

Carbonates of Soda.— There are three of these, the ordinary monocarbonate, or common washing soda, Na_2CO_3, which in its crystalline form contains 10 equivalents of water; the sesquicarbonate, $Na_2CO_3+2NaHCO_3+3Aq$, which occurs in the mineral kingdom as trona and urao; and the bicarbonate, $NaHCO_3$, which is prepared by passing carbonic acid through a concentrated solution of the carbonate till saturation takes place. It is also prepared by exposing the crystallized monocarbonate to the action of a current of carbonic acid; but in this method of making it only the outside portions of the converted crystals should be used, the inner parts being only partially changed. It is ground and dried at a very gentle heat, care being taken to avoid a high temperature, which would cause the formation of the sesquicarbonate. Bicarbonate of soda crystallizes in prisms. It occurs in commerce as a white crystalline powder, which is gradually converted into the sesquicarbonate by exposure to the air. It is much used in medicine, having a much less unpleasant taste than either the mono- or sesquicarbonate, from which it is readily distinguished by giving no precipitate with the magnesia salts. The properties of the monocarbonate are described under manufacture of soda.

Hyposulphite of Soda.— This important salt is now manufactured in tons for photographic purposes and as an antichlore, to extract the last traces of chlorine from paper pulp. It is prepared by fusing equal weights of carbonate of soda and flower of sulphur, and transmitting sulphurous acid through the solution of impure sulphide of sodium thus formed. The liquid is evaporated, and

Soda

hyposulphite of soda crystallizes from the solution in bold prisms.

Manufacture of Soda.—The preparation of carbonate of soda from common salt may be divided into three principal operations: (1) the production of salt cake, or crude sulphate of soda; (2) the transformation of the sulphate of soda into black ash or impure carbonate mixed with sulphide of sodium, by roasting with chalk and coal; (3) the extraction of soda ash, or dry carbonate, by lixiviation with water and evaporation to dryness. The first process is performed by placing about 600 pounds of ordinary salt in a strong iron pan, and mixing it with an equal weight of oil of vitriol. The mixture is then removed to a reverberatory furnace, and the flame allowed to play on its surface till the whole of the hydrochloric acid is driven off, and the chloride of sodium transformed into a dry mass of sulphate of soda, or salt cake, as it is termed. The hydrochloric acid produced is condensed, and used either for the production of chlorine in the manufacture of bleaching powder, or for extracting the copper from the iron pyrites used in making the black ash, or impure carbonate of soda is effected by mingling the sulphate of soda or salt cake formed in the first process with chalk and powdered coal in the proportions of three parts of sulphate of soda, three of chalk, and two of coal. The mixture is thrown into a reverberatory furnace in quantities of 250 pounds at a time, and frequently stirred till melted. Toward the conclusion of the operation, a violent effervescence takes place, carbonic oxide escaping in large quantities, and burning with a green or yellow flame; the products being carbonic oxide, which burns; sulphide of lime, which remains behind; and carbonate of soda, with which it is mixed. This intermediate action is the foundation of the whole process. In practice an excess of coal and chalk is employed, as much of the coal burns away, and an excess of lime is required in order to prevent the formation of any of the soluble sulphides of calcium. The amount of carbonate of soda contained in black ash is about 20 per cent. It is extracted from the mass by breaking it into small fragments and digesting it with warm water for several hours in large vats provided with false bottoms, the last and weakest washings being used to act on fresh portions of black ash. When the lixivium is sufficiently concentrated it is transferred to evaporating pans. The residue left behind is known as soda waste, and consists of a mixture of oxysulphide of calcium and unburnt coal. The efforts of numerous chemists have been fruitlessly employed for the last 50 years in endeavoring to utilize this waste product, which collects gradually near all soda works, and ultimately forms large mountains. The solution of crude carbonate of soda is generally of a dark-green color, from the accidental admixture of iron or manganese, and contains certain proportions of hydrate and sulphate of soda, which are converted into carbonate by mixing the evaporated salts with small coal and sawdust, and in heating in a reverberatory furnace. The resulting salt, which is the soda ash of commerce, is then once more dissolved in water, the solution evaporated to crystallization, when large rhomboidal crystals of ordinary washing soda are obtained. These consist of carbonate of soda with 10 equivalents of water.

Nitrate of Soda.—This salt occurs (like nitrate of potash) as an incrustation on the earth in certain hot districts, more especially in Chile and Peru, where it is found in layers of considerable thickness. It crystallizes in large rhombohedral masses —whence its commercial name of cubic niter. Exposed to the air it deliquesces, and therefore cannot be substituted for niter in the manufacture of gunpowder. It is largely used in the manufacture of nitric acid, being cheaper than nitrate of potash and yielding a larger percentage of acid. It was exported in large quantities during the Russian war (the trade in sulphate being interdicted, that article being contraband of war), for the manufacture of niter by double decomposition with carbonate or sulphate of potash.

Phosphate of Soda.—With phosphoric acid soda forms a large number of crystallizable salts, the most important of which is the rhombic phosphate. It forms large transparent efflorescent rhombic prisms, which have a cooling saline taste and are very soluble in water. It is used medicinally as a purgative and is employed in analysis.

Sulphate of Soda.—Purified sulphate of soda, popularly known as Glauber's salt, is used medicinally as a purgative. In its crude state it is manufactured in enormous quantities from common salt and sulphuric acid, forming salt cake, one of the steps in the soda manufacture. In its anhydrous condition it sometimes forms an incrustation on the surface of the soil, in which state it is known to mineralogists as chenardite. It is also a large product in the manufacture of nitric acid from nitrate of soda.

Sulphite of Soda.—This salt is made on a large scale by passing sulphurous acid over moist soda crystals. By careful evaporation it may be obtained in transparent five or six-sided prisms, which, when exposed to the air, become covered with an opaque crust of sulphite of soda. It has been lately much employed as an antichlore for the preservation of wines and in refining beet-root sugar.

Sodalite, an isometric mineral occurring in rhombic dodecahedrons, also massive. Cleavage, dodecahedral; hardness, 5.5 to 6; sp. gr. 2.136 to 2.4; luster, vitreous to greasy; colors, gray, green, yellow, white, sometimes shades of blue, light red; fracture conchoidal, uneven. Composition: Silica, 37.1; alumina, 31.7; soda, 19.2; sodium, 4.7; chlorine, 7.3 = 100, corresponding with the formula $2(3NaO)_2,3SiO_2+3(2Al_2O_3,3SiO_2+2NaCl$. Occurs in metamorphic and old igneous rocks, also in recent volcanic rocks.

Soda Water, a well-known beverage, which, as usually prepared, is a supersaturated solution of carbonic acid gas in water. Soda water, properly called, consists of one, two, or three drachms of carbonate of soda, dissolved in a pint of water highly impregnated with carbonic acid. This is often a valuable remedy; but it would sometimes be attended by mischievous results if indulged in to the extent which some persons pursue the use of soda water. The mere aqueous solution of carbonic acid which is made by forcing the gas into water by a condensing pump and a pressure of six or eight atmospheres is an agreeable and, generally speaking, harmless diluent.

Sodium, the alkaline metal of which soda is the oxide. It was discovered in 1807 by Sir Humphry Davy. It occurs in large quantities in nature, chiefly in combination with chlorine, as sea salt. It is also found united with oxygen in certain common minerals, such as albite, analcime, labradorite, and kryolite. It also occurs in the form of nitrate, carbonate, biborate, and sulphate. It is found in the ashes of plants, especially those which grow near the sea, such as the salsola soda, formerly the great source of sodium and its compounds, now principally obtained from sea and rock-salt. Sodium has lately become an article of commerce, in consequence of the demand which has arisen for it for the manufacture of aluminium. M. Deville recommends the following method of manufacturing this valuable metal: Dried carbonate of soda 717 parts, powdered charcoal 175 parts, and finely-powdered chalk 108 parts, are mixed intimately, and kneaded into a stiff paste with oil, and calcined in a covered iron pot. The mass is then introduced into a retort and distilled with the same precautions as those used in the manufacture of potassium. This mixture generally yields one-third its weight of sodium. Sodium is a yellowish-white lustrous metal, resembling silver more closely than potassium. It is soft, and may be readily cut with a knife or molded with the fingers. Exposed to the air, it tarnishes immediately, becoming covered with a film of soda; it is therefore preserved in petroleum or some other hydrocarbon. Heated in the air or oxygen, it burns with a bright-yellow flame and is converted into soda. Thrown on water, it decomposes it rapidly, but without eliminating sufficient heat to kindle the hydrogen formed. It is much used in chemical operations for the reduction of the elements having a great affinity for oxygen, such as boron, silicon, calcium, barium, magnesium, etc.; and in the arts for the reduction of aluminium. Its amalgam with mercury, from not requiring to be kept under naphtha, is frequently used for this and other purposes when a strong deoxidizing agent is required. Mercury is placed in a strong glass flask and heated to about 300°; the sodium is then dropped in in pieces the size of a pea. When the whole of the sodium is added, the amalgam is poured out in a flat dish till cold, when it is broken up in small pieces and kept in a stoppered bottle. Equivalent 23; sp. gr. 0.972; fusing point, 194°; symbol, Na (natrium).

Bromide and Iodide of Sodium.— These two salts occur sparingly in sea-water and in the ashes of sea plants, and are the principal commercial sources of iodine and bromine. Like the corresponding salts of potassium, they crystallize in anhydrous cubes which deliquesce on exposure to the air.

Chloride of Sodium.— This important substance constitutes the rock salt of commerce, or common table salt. See Rock Salt.

Sodom, one of the cities of the plain, and for some time the dwelling place of Lot. Its crimes and vices (the nature of which is recalled in the word sodomy) were so enormous that God destroyed it by fire from heaven, with three neighboring cities, Gomorrah, Zeboim, and Admah, which were as wicked as itself. The plain of Siddim, in which they stood, was pleasant and fruitful, like an earthly paradise; but it was first burned, and afterward mostly overflowed by the waters of the Dead Sea or Lake of Sodom. Modern writers on sacred topography, however, are not agreed as to the precise site to be assigned to those cities, no trace of which now remains; the majority holding that they stood on the S. shore of the Dead Sea, near the salt hill of Usdum; while others, again, maintain that the cities of the plain stood in the circle or plain of the Jordan, E. from Bethel and Ai, near where the river discharges itself into the Dead Sea.

Sodom, Apple of, a fruit mentioned by early writers as growing on the shores of the Dead Sea, which was beautiful to the eye, but when eaten filled the mouth with ashes; supposed to have been a gall produced on dwarf oaks by an insect, or the fruit of a species of *Solanum*.

Sodoma. See RAZZI.

Soemmering's Gazelle, in zoölogy, the *Antilope soemmeringii*, from Eastern Abyssinia. It is about 30 inches high, sandy fawn above, with massive lyrate horns, which are more slender in the female. It is sometimes called the Abyssinian mohr to distinguish it from the mohr or mhorr (*Antilope mohr*), an allied species in Western Africa.

Soemmering's Mirror, an instrument for drawing objects under the microscope. It is a plane mirror of polished steel, less in diameter than the pupil of the eye, supported opposite the focus of the eyepiece. It inverts the objects.

Soest, a town of the province of Westfalen, Prussia; 34 miles S. E. of Munster; was once a Hanse town, and one of the most important places in Germany, with a population of between 30,000 and 40,000, but has declined since the Thirty Years' War. Its city law was the model for that of many other cities, such as Hamburg, Lübeck, etc. The remains of its walls with their 36 towers are still to be seen. It has a great number of old churches, of which seven are now in use, the cathedral being Catholic and the remaining six Protestant. Soest is the center of a rich agricultural district, and has chemical works and extensive breweries.

Sofala, the name given to that portion of the S. E. coast of Africa which extends from the Zambesi as far S. as Delagoa Bay. The inland region at the back of the coast district, partly corresponding to Matabeleland, was anciently known as the Empire of Monomotapa (though the word is rather the name of the prince than of the state). Sofala was described by the old geographers as a very rich, gold-producing country, and was judged by some to be the Ophir of Solomon, an idea afterward long discredited, but lately revived since Mauch discovered the disused mine-workings around Zimbabwe, and interest was aroused in them through the British South Africa Company penetrating into that region. Sofala belongs to the Portuguese, who established themselves here in 1505. Their headquarters, the town of Sofala, once a large commercial town, is now a place of only about 1,000 inhabitants.

Soffit, in architecture: (1) The lower surface or intrados of an arch. (2) The ceiling of an apartment divided by cross-beams into compartments. (3) The under part of an overhanging cornice or projecting balcony. (4) The under horizontal face of an architrave between columns. In scene painting, a border.

Sofia, or **Sophia,** capital of the principality of Bulgaria; lies in a fertile plain on the upper waters of the Isker, an affluent of the Danube, to the N. of the Vitsch Mountains, 75 miles N. W. of Philippopolis. The seat of a Greek metropolitan and a Roman Catholic bishop, it has 44 mosques, 22 minarets, 15 Christian churches, 3 synagogues, etc. Sofia is the converging point of several important trade routes (three from the Balkans), and carries on considerable manufactures of cloth, silk wares, leather, and tobacco. In the vicinity are celebrated hot springs, with a temperature of 48° C. Sofia occupies the site of old Sardica, which was built by Justinian. It was taken from the Byzantine emperor Basilius in 987 by the Bulgarians, who called it Triaditza, a name which gave place at the time of the Crusades to that of Stralitz or Sternitz. It fell to the Turks in 1382. During the Russo-Turkish War of 1877–1878 the abandonment of Sofia became necessary as soon as a considerable Russian force had made its way S. of the Balkans, and the retreat was effected without loss. At the Congress of Berlin (July 1878), the English plenipotentiaries strove to join the town and district of Sofia to the province of Eastern Rumelia, but they were eventually included in Bulgaria. On Oct. 25, 1878, Sofia became the seat of government of Bulgaria. Pop. (1906) 82,187.

Sofism, or **Sufism,** the mystical and pantheistic doctrines of the Sofis. They consider that God alone exists; that He is in all nature, and that all nature is in Him, the visible universe being an emanation from His essence. God is the real author of the deeds of men, and there is therefore no valid distinction between good and evil. The passages in the Koran which speak of a paradise and a hell are only allegorical. Man's soul existed before his body, and will transmigrate when he dies into other bodies till sufficiently purified to be absorbed into the deity.

Softas, the pupils who study Mussulman law and theology in the medrissas or secondary schools attached to the mosques. They are boarded in the imarets or free hotels kept up with the revenues of the vakouf property or pious legacies. Their clothing and bedding are furnished by their families, if these are in a position to do so, if not by charity. The number of softas is very great, because they are exempt from military service. After long study of the Arabic language, the Koran, and its commentaries, they pass an examination, which is almost always successful, and which authorizes them to assume the title of khodjas. The name is also applied to all the classes connected with the mosques: Ulemas, Imams, Khodjas, and students of theology or of the jurisprudence of the Koran. Most of them are distinguishable by wearing a white turban around their fez. The Sultan Abdul Medjid (1839–

1861) endeavored to induce his subjects to wear a European dress, and succeeded so far that almost every one, except the very lowest in the public service, adopted it. But the softas, to a man, retain the old-fashioned baggy, slouching dress which Abdul Medjid wished to get rid of. This is an indication of the conservatism of the class. In May, 1876, the sottas were the authors of a revolution at Constantinople, their chief seat; they dictated the dismissal of the grand vizier and were obeyed. Afterward they made a movement against the Sultan himself.

Soft Grass (*Holcus*), a genus of grasses of the tribe Aveneæ taking their name from the soft downy herbage of the common British species, *H. lanatus* and *H. mollis*. The first of these grows naturally in meadows, pastures, by waysides, etc., with a marked partiality for damp, peaty soil. It is of little value, however, for either hay or pasture, notwithstanding the large yield, as cattle and horses have a decided aversion to it. *H. mollis* is usually more slender, with a strong creeping root, and is a less frequent plant than the preceding. The only quality recommending it to cultivation is that the roots serve to bind dry sandy slopes and embankments.

Sogdiana. See Bokhara.

Sognefjord, an extensive fjord on the W. coast of Norway, exhibiting magnificent rock and glacier scenery.

Soignies, a town of Belgium, in the province of Hainault; on the Senne; 22 miles S. W. of Brussels, with a monastery dating from the 7th century. It has breweries and distilleries, and there are large quarries in its neighborhood. To the N. E. is the forest of the same name (now a pleasure-ground for the inhabitants of Brussels), through which the British army marched to the field of Waterloo.

Soil, that part of the disintegrated surface of the earth's crust in which the roots of plants ramify, and from which growing plants derive the mineral substances necessary for their proper development. Soils are formed by the disintegration of the rocks through the continued action of water and air at various temperatures, and by the accumulation of the decaying remains of vegetable organisms. In the process of disintegration water acts variously, as in the bursting action of frost, the gradual wear of running water, and the sawing, grinding, and dashing of the glacier and mountain torrent. The action of the atmosphere is dependent upon the carbonic acid which it contains. This acid is capable of decomposing the silicates of potash and soda, which form part of rocks, seizing the potash and soda and converting the same into carbonates, which are subsequently washed out by water. Besides carbonic acid, chloride of sodium, or common salt, possesses a very powerful solvent action, having in solution the power of dissolving the phosphates of the alkaline earths. The tendency of water and atmosphere combined is to level the earth's surface by destroying eminences and filling up hollows. We often find, therefore, in the plains a soil differing widely from its underlying stratum, on account of its being a mixture of the deposits of streams and the debris of neighboring or more distant mountains. On hills the soil is usually of the same nature as the subsoil.

Organic matter comes first in the very humble form of lichens and other plants which obtain their nutriment almost entirely from the air, and in water plants. As generations grow up and decay, the land slowly increases in organic matter. In proportion as this increase proceeds, the soil acquires the power of retaining those substances necessary for higher vegetable life which were before washed out; and when a soil once possesses the power of retaining all the soluble products of the decomposition of its mineral constituents, other circumstances being favorable, its advance in fertility is more rapid, as not only is the carbonic acid of the air still acting on the as yet undecomposed parts, but the decomposition of vegetable matter, besides keeping the soil in possession of its power of retaining the parts rendered soluble, furnishes a constant supply of carbonic acid within the soil, thereby accelerating decomposition. Thus land left to itself would eventually be covered with a luxuriant vegetation in the form of forests and prairies, through which animals would multiply and increase; and far from the soil becoming poorer, it would become more and more fertile; for in death and decay both animals and vegetables would return to the soil all they had taken from it, in a form more suited for assimilation by plants.

The nature of soil in old civilized countries depends — (1) On the character of the rocks from which they were formed; (2) the nature and direction of the waters that may have flowed over them; (3) the amount of weathering they have received; and (4) the length of time they have been under cultivation, and the nature of that cultivation. A soil may be unproductive through being of such a physical character as not to suit the roots of those plants which we wish to cultivate; through not being able to retain sufficient water for the requirements of plants during drought; through containing principles injurious to the health of plants; through its pores being stopped by water, thereby preventing the entrance of air and carbonic acid; and through not containing a sufficient quantity of those mineral constituents which

the plant requires, in a form adapted for assimilation.

Soils may be characterized by their prevailing primitive earths; hence, they are reduced to sands and gravels, clays, chalky and limestone soils, alluvial soil and peat bogs. Sandy soils are loose, never present a firm surface, and from being without cohesion are incapable of retaining moisture. Being readily permeable by both water and air, they powerfully promote the decomposition of organic matter, while they as readily permit it to be washed away by rains or to escape in the form of gas. One great advantage they possess is their natural warmth; and being loose and friable on the surface they are well adapted for the germination of seeds. To be made to approach alluvial soil, clay and calcareous earth must be added. Gravelly soils are more readily penetrated by rain, and more readily dried by filtration and evaporation, than sands. They may be improved in the same manner. Clayey soil, relatively to water, is the very reverse of sand; relatively to heat, clays do not admit the atmosphere between their particles, and an unimproved clay soil is therefore a cold one. The obvious way to improve such is by the addition of sand and gravel, and, when the clay does not contain lime, by the addition of that material. Lime and chalk soil is much less common than either sand or clay. It may be improved by the laying on of these in sufficient quantity to destroy the tenacity and compactness of its texture. Alluvial soils are composed of very fine particles of the debris of several kinds of rocks, which have been held in suspension by water, and deposited in plains or along the banks of rivers, along with organic matter also held in suspension. The earthy character of this soil must necessarily always partake of the character of the rocks of the country in which it is found.

Peat or bog is composed of partially decayed vegetable matter, soft, light, and spongy to the touch. It holds water like a sponge, so that in its natural state it is quite unfit for the growth of crops. Carbon in soils is found in various states of decomposition, from recent woody fiber to *humus*, which is woody fiber in a state of decay. Magnesia is not very common in soils. Iron is present in almost all soils, but is never very abundant in those naturally fertile. The proportion of organic matter varies exceedingly in different soils. The mixture of various earths and humus, termed loams, constitute the best of soils. These are classified according to the earths which prevail in them, as a sandy loam, etc.; according to their degree of friability, as a free loam, a stiff loam, etc.; or according to both, as a free calcareous loam, etc. They are generally laid on the sides of valleys, along the bases of hills or mountains, or on the banks of upland rivers. In general, much more depends on the texture of a soil, and on its capacity for retaining or parting with water and heat, than on its chemical composition.

Next in importance to the texture of a soil is the nature of the subsoil or substratum on which it rests. The best subsoils are those of clay resting on gravel or porous rock; the worst are those of clay kept moist by subterraneous water. The surface of the soil, in its level or incline, in its aspect and in its color, has necessarily considerable influence on its fertility and its maturing power of the produce which grows on it. Soils are improved by draining, irrigation, manuring, pulverizing, burning, fallowing, resting, and the order in which crops succeed each other.

Soiling, in agriculture, the practice of supporting animals in the summer season with green food of different sorts, cut daily, and given to them in racks in the stalls or yards, instead of sending them to the fields.

Soirée, properly an evening party held for the sake of conversation only; now applied to various kinds of evening parties, at which ladies and gentlemen meet, whatever may be the amusements introduced. The word is frequently employed to denote a meeting or reunion of the members of certain societies or bodies and their friends, for the promotion of the objects of their associations, and for mutual improvement and discussion, when tea, coffee, and other light refreshments are provided during the intervals of music, speech making, etc.

Soissons, a town and fortress of France, in the department of Aisne; on the Aisne river; 65 miles N. E. of Paris. It is the key of Paris for an army invading France from the Netherlands, and is the meeting point of several military roads. The principal building is the cathedral, founded in the 12th century, the library of which contains many rare MSS. There are also some remains of the great castellated abbey of St. Jean des Vignes (1076), where Thomas à Becket found refuge when in exile. The church of St. Peter (Romanesque) dates from the 12th century; there are slight remains of the once celebrated abbey of Notre Dame (founded 660) and of the abbey church of St. Léger (1139). Quite near to Soissons is an institution for deaf and dumb, which occupies the site of the famous abbey (560) of St. Médard, where Clotaire and Siegbert were buried. The civil buildings embrace a college and a museum of antiquities. Soissons is one of the oldest towns in France, and was celebrated even in the time of the Romans, when it bore the name first of Noviodunum, and afterward of Augusta Suessionum; hence its modern name of Soissons. It was the second capital of Gallia Belgica,

and subsequently the most important town of the Romans in Northern Gaul. Near to it Clovis overthrew Syagrius, the Roman commander, in 486. The same prince made Soissons the seat of the Frankish monarchy of Neustria. Here Pepin was crowned king, and Louis the Pious imprisoned. It was the gathering place of more than one important council and has been repeatedly captured and sacked in war — *e. g.* six times during the Hundred Years' War, by the Armagnac party in 1414, by Charles V. (1544), the Huguenots (1565), three times in 1814, and by the Germans in 1870. Pop. (1901) 13,240.

Sojourner Truth, an American abolitionist; born of slave parents in Ulster co., N. Y., about 1775; was sold to John J. Dumont when 10 years old; was freed by the act of the New York Legislature in 1817, but did not secure her liberty till 1827, when she escaped to New York city. In 1851, in company with George Thompson of England, and other abolitionists, she began lecturing on women's rights, temperance, politics, and other questions concerning the welfare of her race. Though she could neither read nor write, her personality and powerful voice made her an effective speaker. Her name was Isabella, but she adopted the name of "Sojourner", claiming to have heard it from the Lord. To this she added the word "Truth" to indicate that all she imparted to men was absolutely true. She died in Battle Creek, Mich., Nov. 26, 1883.

Soko, an anthropoid ape, probably a species of *Troglodytes*, described by Livingstone as living W. of Lake Tanganyika.

"They often go erect, but place the hand on the head as if to steady the body. . . . When seen thus the soko is an ungainly beast. . . . His light yellow face shows off his ugly whiskers and his faint apology for a beard; the forehead villainously low, with high ears, is well in the background of the great dog-mouth; the teeth are slightly human, but the canines show the beast by their large development. The hands, or rather the fingers, are like those of the natives. The flesh of the feet is yellow. . . . The soko is represented by some to be extremely knowing, successfully stalking men and women while at their work; kidnapping children, and running up trees with them."—Livingstone, "Last Journals."

Sokoto, or **Sackatoo,** a large town in Central Africa, on the Sokoto or Rima river, which falls into the Niger. It is surrounded by lofty walls, is fairly well built, and has regular streets, a royal residence, several mosques, manufactures of cotton cloth, and carries on an extensive trade. Pop. given at 80,000. The same name belongs to a former extensive Fellata kingdom (now a province of Northern Nigeria), of which the town was once the capital, though Wurno has now that rank; area, about 170,000 square miles. The country has been opened to British trade.

Sokotra. See SOCOTRA.

Sol, the Roman name of the sun god.

Sola, or **Shola,** in botany, the *Æschynomene aspera*, a small half-floating papilionaceous bush found in marshes in Bengal, India, and growing most during the season of inundation. In Burma a fiber is made from the bark. The pith is used in India for making light sola hats, worn constantly by Europeans. They are generally covered with white cloth and sometimes have a cream-colored turban round. The Bengalees use the sola as floats for nets, and the pith for decorations in temples.

Solanaceæ, or **Solaneæ,** a natural order of exogenous plants, mainly herbaceous plants and shrubs, but including a few tropical trees. The leaves are mostly alternate, undivided or lobed, without stipules. The flowers are regular, or nearly so; the calyx and corolla generally five-cleft; the stamens generally five. The fruit is either a capsule or a berry, usually two-celled. The plants of this order are mostly natives of tropical countries, a small number extending into the temperate climates; in the coldest regions they are entirely wanting. They are mostly distinguished by an offensive smell and by containing a narcotic, poisonous substance, usually associated with a pungent principle, and some of them are among the most active poisons. Sometimes the narcotic substance predominates, as in mandrake and henbane; sometimes the pungent substance predominates, or is alone present, as in cayenne pepper (capsicum); sometimes both are present in more or less equal proportion, as in tobacco, thorn apple, and belladonna. The fruit is generally poisonous; but that of a considerable number of species, in which acids and mucilage predominate, is eatable — *e. g.*, the berries of the winter cherry and other species of physalis, of the egg plant and some other species of solanum, and of the tomato. The tubers which occur in a few species contain much starch and serve for food, the potato being the chief example. The seeds of all contain a fixed oil, which in the S. of Germany is expressed from the seeds of the belladonna itself.

Solan Goose, the gannet, *Sula bassana*. Bill grayish white, naked skin of the face blue, iris pale yellow, head and neck buff, the primaries black, all the rest of the plumage white in the adult, front of the legs and tarsi green. Length 34 inches. They breed in immense numbers on the Bass Rock, in the Firth of Forth, the coasts of the Baltic, Iceland, North America, and South Africa.

Solanine, in chemistry, $C_{43}H_{71}NO_{16}(?)$, an organic base existing in several species of solanum. To obtain it the juice of the ripe berries is precipitated by ammonia, and the precipitate purified by recrystallization from alcohol. It crystallizes into

slender silky needles, slightly soluble in cold, easily in hot alcohol, nearly insoluble in water and ether, has a slightly bitter and burning taste, and is very poisonous. It melts at 235°, and forms acid and neutral salts, all of which are soluble in water.

Solanum, the nightshade; the typical genus of *Solanaccæ*. Herbs or shrubs, rarely trees. Flowers in or above the forks of the stem, solitary, fascieled, or cymose, white or blue; calyx with 4 to 10 segments, corolla rotate, 5 to 10 lobed, with five exserted stamens, anthers opening by two pores at the extremity; berry roundish, two or more celled, with many reniform seeds. Known species between 500 and 600, most of them from the tropics, others from temperate climes. The foliage of *S. dulcamara* is narcotic, and its berries are unsafe to eat. In India it is used in decoction in chronic rheumatism, psoriasis, etc. One or two grains of the dried leaf of *S. nigrum* will produce narcotism and visceral disturbance. The leaves when bruised are applied in poultices or baths to painful wounds. The berries are considered by the Hindus to be tonic and diuretic, and the juice a hydragogue, cathartic, and diuretic; they are given in dropsy, etc. A syrup prepared from the plant is used as a cooling drink in fevers, and as an expectorant and diaphoretic. *S. tuberosum* is the POTATO (*q. v.*), the leaves are powerfully narcotic and used in chronic rheumatism, painful affections of the stomach, etc. The fruit of *S. melongena,* the egg plant, and *S. verbascifolium* are used in India in curries. The berries of *S. coagulans, S. xanthocarpum,* wild in India, and the fruits of *S. gracilipes,* a garden escape there, are eaten. The last two, with *S. ferox, S. indicum, S. trilobatum,* are also used medicinally in India. Fumigation with the burnt fruit of many of them is a domestic remedy for toothache. *S. pseudoquina* produces the quina of Brazil. *S. mammosum, S. paniculatum, S. guineense* are diuretic; a decoction of the leaves of *S. cernuum* is a powerful sudorific. *S. marginatum* is used in Abyssinia for tanning leather. The berries of *S. muricatum, S. nemorense,* and *S. quitoense* are eaten. *S. laciniatum* produces the kangaroo apple of Tasmania, which is eaten.

Solar Cycle, in chronology, a term applied to one of those artificial periods made use of in chronological researches. It comprehends a period of 28 years, compounded of 7 and 4, the number of days in a week, and the number of years in the interval of two leap years. This cycle remained undisturbed till the end of the 19th century; but in consequence of the year 1900 not being reckoned as a leap year, the whole cycle was then overthrown. It may, however, be reconstructed after 2000, that year being reckoned as leap year; it will then last till 2100.

Solar Motor. Why should we burn costly, hard-delved coal in power houses, when we can hitch our trolley cars to the sun and have them propelled for the asking? But how to hitch them — that has been the problem with which scientific men have wrestled for years. Now it has been solved, and the principle of the invention, like the principle of all great inventions, is exceedingly simple. If you take a sun glass and a toy engine, and can get sufficient heat at the focal point of the sun's rays below the glass to make the water bubble in the tiny boiler, you will have steam and presently power. This has now been done by the new solar motor. The motor is in successful operation, working a 15 horse power engine at the ostrich farm at Pasadena, Cal., and it is used to pump water. It lifts 1,400 gallons a minute.

The solar motor may be likened to an enormous open umbrella with a part of the top cut off, and set at an angle to catch the sunshine on its many mirrors and to reflect it upon the long slim boiler, set in the center like the handle of the umbrella. From the boiler the steam is conducted in pipes to a compound engine operating a centrifugal pump. There is little manual work to be done in connection with the machine. To turn a crank and to clean it now and then is all that it requires. It is 35 feet from the uppermost part of the rim of the umbrella to the ground, which distance nearly represents the whole diameter of the circle. There are in the reflector 1,800 glass mirrors, each about three inches wide and two feet long. Supporting the upper part of the umbrella which is heavily ribbed with steel, is a tall iron framework like that set up for windmills, and under the bottom is an equatorial mounting, something like that used with large telescopes. The solar motor is automatically balanced, the weight resting on roller bearings, so that only a few pounds of hand pressure are required to turn it in any way that may be desired. When the operator wishes to get up steam he turns a crank and swings the reflector into focus, guided by an indicator. When the focus is once obtained the great umbrella, like a sunflower, automatically keeps its shining face toward the sun. Here, too, the inventors have learned a lesson from the astronomers, for a common clock is made to do duty as a regulator.

At first the morning dew is seen slowly to ascend in a wreath of vapor from the gigantic mouth. Then the bright glasses glitter in the sun and the heat lines begin to quiver inside the circle, the greatest commotion being about the long, black boiler, which, as the intensity of the fo-

cused rays increases, begins to glisten, so that in any photograph taken of the machine, the boiler is shown almost as pure white. Within an hour of the time of turning the crank and getting the focus (if no clouds intervene to throw shadows into the reflector) there is a jet of steam from the escape valve. The engineer moves the throttle, there is a succession of hisses from the umbrella handle, a "clank-clank-clankety-clank!" and the sun is drawing water in a way of which he little dreamed before.

Once started, the machine runs all day without any attention whatever. The man in charge may hoe his garden, or read his novel, or eat oranges, or go to sleep. The machine oils itself. The supply of water for the boiler is regulated automatically, as is also the steam pressure, and there can be no explosion. The motor can be left alone and will run till the sun gets so low that there is no more heat. Then it will stop, rest over night, and all that is needed to start it when the radiant energy again asserts itself is the twist of a couple of handles.

The machinery was made in Boston, and Southern California, the land of almost perpetual sunshine, was selected as the best place to give the motor its first practical trial. The successful motor is the result of nearly ten years' experimental work and of a very considerable outlay of money. Device after device was made and rejected. A model was first built and set up in Denver, and its feeble workings convinced the promotors of the plan that they were on the way to success.

It is now thought that solar motors will before long be seen all over the desert as thick as windmills in Holland and that they will make the desert to blossom as the rose — a phrase that literally represents the possibilities of the machine; for windmills will run only so long as the wind blows, and for weeks at a time on the dessert there is no wind; but the sun shines nine days cut of the ten upon the great, waste land, where oranges may be growing, lemons yellowing, and grapes purpling under the glare of sun which, while it ripens the fruits will also water and nourish them.

Cheap power means cheap homes in the arid regions of the Southwest — homes for millions of men where there are now only hundreds. Coal is exceedingly expensive and there is little wood to be had. If the sun motor will pump water, it will also grind grain and saw lumber and run electric cars. In any land of long sunlight there need be no stop over night of the machinery run by solar motors; for the storage of electric power by the machine is promised by engineers.

Of the many former and unsuccessful devices to utilize the sun's heat for power — aside from the mere toys of tinkering inventors — Ericsson's is the most famous. The mind that modeled the Monitor gave years to this problem. But Ericsson's sun motor was not successful. Prof. S. P. Langley, of the Smithsonian Institution, wrote 16 years ago:

"Future ages may see the seat of empire transferred to regions of the earth now barren and desolated under intense solar heat — countries which, for that very cause, will not improbably become the seat of mechanical and thence political power. Whoever finds the way to make industrially useful the vast sun power now wasted on the deserts of North Africa or the shore of the Red Sea, will effect a greater change in men's affairs than any conqueror in history has done; for he will once more people those waste places with the life that swarmed there in the best days of Carthage and of old Egypt, but under another civilization, where man shall no longer worship the sun as a god, but shall have learned to make it his servant."

Solar Plexus, in anatomy, a nervous center at the upper part of the abdomen behind the stomach and in front of the aorta and the pillars of the diaphragm. It is the largest of the pre-vertebral centers. Called also the epigastric plexus.

Solar Prominences, red flame-like masses seen in the atmosphere of the sun at a total solar eclipse. See SUN.

Solar Star, the name given to those stars which from the spectrum analysis of their light are supposed to be in the same state of heat, etc., as our central sun is at the present time.

Solar System, the sun and all the bodies, by whatever name they may be called, which periodically revolve round the sun as a center. Visible to us are seven distinct orders or systems of revolving worlds. They are the zodiacal light, whatever that may be, the planetary, the satellitic, the meteoric, the cometary, the stellar, and the nebular systems. All but the latter two belong to our solar system. The limits of the planetary system, as far as known, are Mercury, the nearest to the sun, and Neptune, the most distant. It, however, would not greatly surprise the astronomical world to hear that a trans-Neptune planet had been discovered, though there is at the present time no perturbative evidence of its existence, as there was in the case of Neptune. This limit does not include the hypothetical intra-Mercurial planets, discovered during the total solar eclipse, in 1878, by Watson and Swift. Its cometary extent is not known, and never will be, as several comets have computed periods of over 1,000,000 years, and even their aphelia reach only a step toward even the nearest star. The sun's far-reaching power, of course, extends to half way to the stars, and it is not an unreasonable supposition to suppose that there are comets whose aphelia extend that far, and if so, their

periodic times must be several million years.

The bodies as far as known that are denizens of our solar system are the sun (the center), the planets of Mercury, Venus, earth with one satellite, Mars with 2 satellites, 428 asteroids, Jupiter and 5 satellites, Saturn with 5 rings and 8 satellites, Uranus with 4, and Neptune with 1, also Halley's, Pons', and Olbers' comets of long period, and about 25 of short period, ranging from 3.3 years (Encke's) to 13.78 years, commonly, but unjustly, called Tuttle's comet. It was discovered by Méchain in 1790. To the list must be added 200 or more meteoric rings, which, while the earth is passing through them, produce the star showers. The next return of Halley's comet is calculated for about 1912; Pons', 1995; Olbers', 1960. Every member of the solar system, be it planet, satellite, meteoroid or comet, moves in an orbit called an ellipse, of greater or lesser eccentricity. The ancients were loath to believe that the Creator would cause or permit the planets to move in any orbit but that most beautiful and symmetrical of curves, the circle, which they considered symbolical of Divine perfection. As soon, however, as they banished this delusion and substituted the ellipse, they found that at all times computation and observation of the places agreed, while before they agreed and disagreed periodically. There is not a heavenly body known to man that moves in a circle. The planets and satellites revolve in elliptic orbits, while the comets move some in elliptic and others in parabolic and hyperbolic orbits. Those moving in either of the latter two can never return, as the two branches of their paths do not meet to form a closed curve as does the ellipse. For adopting the ellipse instead of the circle for planetary revolution the world is indebted to the genius of Kepler, who by the first of his three laws brought harmony out of confusion. The three laws of Kepler, as enunciated by him, are: (1) The planets move in ellipses, having the sun in one of the foci. (2) The radius vector of each planet describes equal areas in equal times. (3) The squares of their periodic times are proportional to the cubes of their mean distances from the sun. As all heavenly bodies hang suspended on nothing throughout all space, each being attracted by all the others, it results that they must move, and, while the motions of the planets are easily noticeable in a few hours, and even minutes, it requires to detect motion in the stars long-continued observation with instruments of great delicacy and power to ascertain that they have any motion at all, so far away are they. No planet whose orbit is interior to the earth's can ever assume the crescent phase, or rise when the sun sets, or be on the meridian at midnight, or transit the sun. On the other hand, those whose orbits are exterior to ours can never assume the crescent and half-moon phase, and are the only ones that can ever be in opposition, rising at sunset. There seems to have been a special design in placing the four giant planets farthest from the sun and from each other, and a like design in locating the four smaller planets nearer together and to the sun. Were the order reversed, it is doubtful if the planetary system could endure, certainly not with the order and stability that characterizes their existing movements.

PRINCIPAL ELEMENTS OF THE SOLAR SYSTEM.

Name.	Mean Distance from Sun.	Sidereal Period.	Orbit Velocity.*	Eccentricity of Orbit.	Inclination to Ecliptic.	Diameter, (Earth = 1.)	Mass, (Earth = 1.)	Volume, (Earth = 1.)	Density, (Water = 1.)	Rotation Time.	Gravity at Surface.	No. of Satellites.
Mercury	0.39	0.24	23.35	.206	7° 0′	0.382	0.1?	0.056	10.?	....	0.6?	0
Venus	0.72	0.62	21.9	.007	3°24′	0.972	0.78	0.920	4.8	.....	0.83	0
Earth	1.00	1.00	18.5	.017	0° 0′	1.000	1.00	1.000	5.58	23h. 56m.. 4.09s.	1.00	1
Mars	1.52	1.88	15.0	.093	1°51′	0.534	0.11	0.152	4.01	24h. 37m..	0.38	2
Jupiter	5.20	11.86	8.1	.048	1°19′	10.92	316.0	1,309.	1.33	9h. 55m.. ÷	2.65	4
Saturn	9.54	29.46	6.0	.056	2°30′	8.97	94.9	721.	0.72	10h. 14m.. 12s.	1.18	8
Uranus	19.18	84.02	4.2	.046	0°46	4.03	14.7	65.	1.22	....	0.91	4
Neptune	30.06	164.78	3.4	.009	1°47′	4.39	17.1	85.	1.11	....	0.88	1
Sun	.....	.....	.....	.....	7°15′	109.4	331100	1,310,000	1.39	24d. 7h. 48m.	27.65	..
Moon	.....	.....	0.636	.055	5° 9′	0.273	0,0123	0.020	3.40	27d. 7h. 43m.	0.165	..

*Miles per second.

Solar Time, time as indicated by a sundial. The successive hours so indicated are not equal intervals of time.

Solatium, in ordinary language, anything which consoles or compensates for suffering or loss; a compensation. In law, a sum of money paid over and above actual damages to an injured party, by the person who inflicted the injury, as solace for wounded feelings. In ecclesiology, an additional daily portion of food allotted to the inmates of religious houses under exceptional circumstances.

Solberg, Thorwald, an American copyright expert; born in Manitowoc, Wis., April 22, 1852; served on the staff of the

Library of Congress in 1876–1889; was manager of the literary department of the Boston Book Company in 1889–1897; took an active part in the effort to secure an international copyright; was a member of the American Copyright League, the International Literary and Artistic Association of Paris, and in July, 1897, was appointed United States register of copyrights. He was the author of numerous reports, bibliographies, etc.

Soldanella, in botany, a genus of *Primulidæ*. Corolla sub-campanulate, of one cleft, fringed on the margin. *Soldanella alpina*, from the S. of Europe, is cultivated in English gardens.

Solder, or **Soder,** a metal or alloy used to unite adjacent metallic edges or surfaces. It must be rather more fusible than the metal or metals to be united, and with this object the components and their relative amounts are varied to suit the character of the work. Hard solders are such as require a red heat to fuse them; they are employed for joining brass, iron, and the more refractory metals. Soft solders melt at a comparatively low temperature, and are used with tin and lead, of which metals they are wholly or in part composed. Common tin solder, composed of (1) tin and (2) lead, is perhaps the best-known example of this class. Spelter and silver solders are the most generally used among the hard solders.

Soldering, the process of uniting two pieces of the same or of different metals by the interposition of a metal or alloy which by fusion combines with each. In autogenous soldering, the two pieces are directly united by the partial fusion of their contiguous surfaces. In the ordinary process of soldering small articles, the workman places the two metallic surfaces together, and then, with his soldering iron, which has been previously heated in a furnace, melts off sufficient solder from the stick or cake, allowing it to flow on and between the parts to be joined; the hot iron is then applied to the joint, so as to cause the solder to become uniformly fluid, equalize its distribution, and smooth its exposed surface. The surfaces to be joined must be perfectly cleansed by filing or scraping, and the flow of the melted solder is also assisted by the employment of certain substances as either deoxidizers or fluxes; among these, resin, sal-ammoniac, or muriatic acid are chiefly used. Instead of a soldering iron some form of blow pipe is often employed to heat the solder. Another method sometimes employed to solder small brass articles is to face and clean the two surfaces, rub them with sal-ammoniac or dilute acid, and then squeeze them into contact with a piece of tinfoil between them. When the whole is heated, the two are soldered together by this melted tinfoil.

Soldering Blowpipe, a portable gas blow pipe, which can be attached by a flexible tube to any gas supply. Another flexible tube allows a blast from the mouth to be blown through the center of the gas flame, which can be directed to any part of a water pipe or other article. The usual form of blow pipe is also often used for soldering purposes.

Soldier Police of Canada. To the bravery, courage and efficiency of the Northwest Mounted Police is due the security in which live the inhabitants of that wonderful country which stretches from the Great Lakes to the Rocky Mountains and from the 49th parallel to the Arctic Ocean. In 1873, 150 men were sent to Manitoba from Eastern Canada; the following year, the force, increased to 300, marched to the Rocky Mountains. Within a few years it numbered 500 men and during the Riel rebellion was 1,000 strong. It was divided into 10 divisions, each division being designated by a letter and the depot. In 1894 the number was reduced to 750, and in 1898 there were 548 men in the Northwest Territories and 184 in the Yukon. There are three divisional headquarters near the United States boundary line, and in each division there are outposts with from 2 to 10 men each. The police officers are: a commissioner and assistant commissioner; in each division a superintendent and two inspectors, and at headquarters two extra inspectors, one as quartermaster and the other as paymaster. There are five surgeons, a veterinary surgeon and assistant and in each division a veterinary sergeant to look after the horses. The pay of these officers ranges from that of the commissioner, $2,600 per year, to that of the constables, 50 to 75 cents per day. The full-dress uniform is a scarlet tunic with yellow facings, blue cloth breeches with yellow stripes, white helmet, cavalry boots, and cavalry overcoat. In winter fur overcoats and moccasins are worn when necessary. In summer a khaki uniform and cowboy hat are worn. Each man has a horse and is armed with a carbine, usually a 45–75 Winchester, and a 44 Enfield. The artillery armament consists of six 7-pounder guns, four 9-pounders, two mortars, and two Maxim machine guns. In barracks a strict military routine is followed.

The astonishing control which this handful of officers and men has exercised over the settlers, quarrelsome Indians, and the cattle-thieving, whisky-smuggling outlaws of the plains is a proof of the wisdom and justice on which this admirable department is founded. The orders of the police are to arrest and not to kill, and no member of the force is allowed to strike an Indian, no matter what abuse or personal

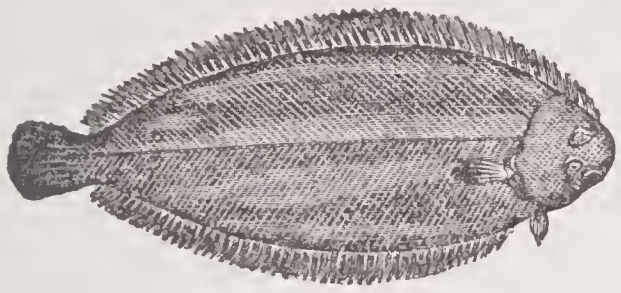
attack may be made on him. Valuable lives have been sacrificed in obedience to these orders, but the savages have gradually come to see that they are treated with fairness and justice both in and out of the courts, and that while the relentless arm of the law is sure to seize them for their misdeeds, they will have a fair trial. Besides their duties as police these men procure for the government a vast amount of statistical information. They report on the state of the crops, the number of cattle, and condition of the ranches; the best kinds of grains suitable for the soil; the condition of the roads and bridges; the moral, physical, and financial condition of new settlers; everything, in short, that can possibly be of use to the authorities. For the arduous service required of him the soldier policeman must be a man of great strength, endurance and courage, with no ordinary amount of intelligence. When it is remembered that two of these unassuming, quiet soldiers have dispersed a gathering of hundreds of savages, and a force of 20 subdued Sitting Bull and his 500 warriors without striking a blow, we have some realization of their efficiency and the power of the government back of them.

Soldiers' Homes, institutions provided by National and State governments for the care of sick and disabled soldiers and sailors. The National Home for Disabled Volunteer Soldiers has branches at Dayton, O.; Milwaukee, Wis.; Togus, Me.; Hampton, Va.; Leavenworth, Kan.; Santa Monica, Cal.; Marion, Ind.; and Danville, Ill. The aggregate number of inmates is about 27,000. The requirements for admission are: (1) An honorable discharge from the United States service. (2) Disability which prevents the applicant from earning his living by labor. (3) Applicants for admission will be required to stipulate and agree to abide by all the rules and regulations made by the Board of Managers or by its order; to perform all duties required of them, and to obey all the lawful orders of the officers of the Home. Attention is called to the faet that by the law establishing the Home the members are made subject to the Rules and Artieles of War, and will be governed thereby in the same manner as if they were in the army of the United States. (4) A soldier or sailor must forward with his application for admission his discharge paper, and when he is a pensioner, his pension certificate, and if he has been a member of a State Home, his discharge from that Home, before his application will be considered; which papers will be retained at the branch to which the applicant is admitted, to be kept there for him, and returned to him when he is discharged. The rule is adopted to prevent the loss of such papers and certificates, and to hinder fraudulent practices; and no application will be considered unless these papers are sent with it. If the original discharge does not exist, a copy of discharge, certified by the War or Navy Department, or by the Adjutant-General of the State, must accompany the application. Soldiers or sailors whose pensions exceed $16 a month are not eligible to the Home unless the reasons are peculiar and are explained to the manager and are satisfactory to him. Those who have been members of the State Homes must have been discharged from those Homes at least six months before they can be admitted to a branch of the National Home, except by a vote of the Board of Managers. Applicants are requested to conform strictly to the above requirements.

The United States Soldiers' Home in the District of Columbia receives and maintains discharged soldiers of the regular army. All soldiers who have served 20 years as enlisted men in the army (including volunteer service, if any), and all soldiers of less than 20 years' service who have incurred such disability, by wounds, disease, or injuries in the line of duty while in the regular army, as unfits them for further service, are entitled to the benefits of the Home. A pensioner who enters the Home may assign his pension, or any part of it, to his child, wife, or parent, by filing written notice with the agent who pays him. If not so assigned it is drawn by the treasurer of the Home and held in trust for the pensioner, to whom it is paid in such sums as the commissioners deem proper while he is an inmate of the Home, the balance being paid in full when he takes his discharge and leaves the Home. Inmates are subject to the Rules and Articles of War, the same as soldiers in the army. They are comfortably lodged, fed, and clothed, and receive medical attendance and medicine, all without cost to them. There are 1,250 men now receiving the benefits of the Home. The Board of Commissioners consist of the General-in-Chief commanding the army. The Surgeon-General, the Commissary-General, the Adjutant-General, the Quartermaster-General, the Judge-Advocate-General, and the Governor-General of the Home. Applications for admission to the Home may be addressed to the "Board of Commissioners, Soldiers' Home, War Department, Washington, D. C.," and must give date of enlistment and date of discharge, with letter of company and number of regiment for each and every term of service, and rate of pension, if any, and must be accompanied by a medical certificate showing nature and degree of disability if any exists. There are State Homes for disabled volunteer soldiers provided by the States of California, Colorado, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Montana,

Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Vermont, Washington, Wisconsin, and Wyoming.

Sole (*Solea vulgaris*), a marine fish belonging to the *Pleuronectidæ* or flat fishes, of an oblong or oval form. These fish abound on the British coast, and also on all the coasts of Europe, except the most N. where the bottom is sandy. They furnish a wholesome and delicious article of food.



COMMON SOLE.

They sometimes ascend rivers, and seem to thrive quite well in fresh water. The sole sometimes grows to the weight of 6 or 7 pounds. The name is also given in America to certain other flat fishes. The sole is at its worst from February to the end of March, this being the spawning season. It is usually captured by the trawl net.

Solea, the sole, or the under surface of the foot or hoof of an animal. In ichthyology; a genus of *Pleuronectidæ,* with about 40 species, from the coasts of temperate and tropical seas; absent only from the S. portion of the S. temperate zone. Some of the species enter or live in fresh water. Eyes on right side, upper in advance of lower; mouth-cleft narrow, twisted to the left side; villiform teeth, on the blind side only. Dorsal commences on snout, distinct from caudal; lateral line straight; scales small and ctenoid.

Solecism, the term applied to any violation of the grammar or idiom of a language or of the usages of society. The word is derived from the city of Soli in Cilicia, whose inhabitants spoke very bad Greek, in consequence of their intercourse with the Cilician natives, and provoked the fastidious Athenians to coin the epithet.

Solemn League and Covenant. See COVENANT.

Solen, in surgery: (1) a cradle for a broken limb. (2) A tent or tilt of splits or wands to hold the bedclothes from contact with a broken or sore limb. In zoölogy, the typical genus of the family *Solenidæ,* with 33 species, universally distributed, except in the Arctic seas. Shell very long, sub-cylindrical, straight, or slightly recurved margins parallel, ends gaping; beaks terminal or sub-central; hinge-teeth $\frac{2}{2}$; ligament long, external pallial line extending beyond adductors; sinus short and square. Animal with mantle closed except at front end and a minute ventral opening; siphons short, united, fringed; palpi broadly triangular; foot cylindrical, obtuse.

Solenhofen Beds, in geology, beds consisting chiefly of a fine fissile slate, used for lithographic purposes, found at Solenhofen and Eichstadt. It is probably of the age of the English kimmeridge clay, or of the coral rag. It has beautifully preserved the numerous fossils which it contains. They include fishes, reptiles, archæopteryx, etc.

Solenostoma, in ichthyology, the sole recent genus of *Solenostomidæ,* with two or three small species from the Indian Ocean. Snout produced into a long tube; body compressed, tail very short. All parts covered with thin skin, below which there is a dermal skeleton formed by large star-like ossifications. No air bladder or pseudobranchiæ; branchiostegals four, very thin. This genus is remarkable as being one of the two genera of fishes in which the care of the eggs and young is undertaken by the female, the other being the Siluroid genus *Aspredo.* In solenostoma the inner side of the ventral fins coalesces with the integuments of the body, forming a large pouch for the reception of the eggs.

Solent, that part of the British Channel separating the N. W. shore of the Isle of Wight from the mainland of Hampshire, and extending between the Needles and West Cowes. It has a width varying from 2 to 5 miles, and affords a safe and well-sheltered roadstead.

Soleure, a canton in the N. of Switzerland; bounded on the W. and S. by Bern, and on the N. and E. by Basel and Aargau; area, 306 square miles; pop. (1905) 106,546, mostly Roman Catholics and speakers of German. The greater portion of the canton is fertile and well cultivated, especially in the valley of the Aar. But it also embraces outlying ranges of the Alpine and Jura systems. Besides grain, the principal products are fruit, timber, cherry brandy, cheese; cotton, paper, iron, hose, clocks, etc. The canton consists of the territories acquired by the town of Soleure. The legislative council is elected by the people, and that body chooses the executive (five members), both for four years. But both bodies are subject to the immediate control of the people, as well as every act they do, by means of the referendum.

Soleure, the capital of the canton, is situated on both sides of the Aar, 18 miles N. N. E. of Bern. The most notable building is the cathedral of St. Ursus, built in 1762–1763 on the site of an older church (1050), with a cupola and façade of Corin-

thian columns. There are also a curious old clock tower, an arsenal with a museum of ancient trophies of war, and collections of antiquities. The principal objects of industry are cotton, clocks, and cement. Pop. 10,030. Soleure (Salodurum) was a place of some consequence in Roman times, was made a free city of the empire (1218), joined the Swiss Confederation in 1481, and in 1828 was chosen the bishop's see for the diocese of Basel. Close by are the baths of Weissenstein, with a celebrated "whey cure" that is very much frequented.

Solfatara, in geology, a volcanic vent, emitting sulphurous, muriatic, and acid vapors or gases. Solfataras are essentially hot springs in which the dissolved acids decompose the rocks through which the water flows, sending mud to the surface, and depositing nodular masses of sulphur in the clay of their beds.

Solferino, a village and commune of Italy, in the province and 18 miles N. W. of Mantua. In 1796 the Austrians were here defeated by the French prior to the siege of Mantua; it was here also, June 24, 1859, that a battle was fought between the French and Sardinians on the one side and the Austrians on the other, resulting in the defeat of the latter and the subsequent treaty of Villafranca.

Solicitor, a legal practitioner whose business it is to commence, carry on, or defend suits at law on behalf of persons who employ him, and who usually also carries on conveyancing and other non-contentious business. In England the term was formerly applied distinctively to agents practising before the courts of chancery, attorneys being those who practised in the courts of common law; but by the Judicature Act of 1873 all persons practising before the supreme courts are now called solicitors, and the term attorney is practically obsolete. In the United States a solicitor is a person employed to follow and take charge of suits depending in courts of chancery. A solicitor, like an attorney, will be required to act with perfect good faith toward his clients.

Solicitor-General of England is a law officer of the crown whose function it is to assist the Attorney-General (*q. v.*), the two having equal authority. The Solicitor-General of Scotland has the same function relative to the Lord Advocate. See Advocate, Lord.

Solicitor to the Treasury, in the United Kingdom, is an officer who acts as attorney for the government in all legal proceedings, and for all the departments of government for which no special solicitor has been appointed.

Solidification, the passage of a body into the solid state. A body, on solidifying from the liquid state, gives up a quantity of heat without exhibiting a decrease of temperature. Two laws are recognized in the solidifying of bodies from a state of fusion: (1) A substance begins to solidify at a temperature which is fixed if the pressure is fixed; at ordinary atmospheric pressure this temperature is the temperature or point of fusion for the particular substance. (2) From the moment solidification commences till it is completed the temperature of the liquid portion is constant. There are some substances, such as glass and iron, which become plastic before liquefying, and therefore possess no definite point of fusion; and for such substances the above laws do not hold. Solidification is called crystallization when crystals which may be seen are formed. When water solidifies the resulting ice is about $\frac{1}{11}$ larger than the volume of water which produced it, and on this account ice floats on the surface. Cast iron is larger, at the temperature of the fusing point, in the solid than in the liquid state; so also is bronze and other metals which give good sharp castings. In many cases, however, a substance contracts in the act of solidifying. See Freezing.

Solidism, in medical practice, the theory which refers all diseases to alterations of the solid parts of the human body, on the ground that only they are endued with vital properties, subject to the impression of morbific agents, and the seat of pathological phenomena. In all pathological investigations the condition of both solids and liquids is now taken into account.

Solidungula, in zoölogy, a lapsed group, equivalent to the modern Equidæ (*q. v.*).

Solidus, a Roman gold coin. The "solidus," or "solidus aureus," was adopted by the Franks under the Merovingians and Carlovingians (at 87 to the Roman pound) till the time of Pepin, who suppressed it; but another solidus of silver, or "solidus argenteus"— the $\frac{1}{20}$ of the libra or pound — which had been used only as a money of account, was soon after made a coin. In later times this "sol" or "sou," like all other coins, underwent an infinity of variations in fineness and value. On the introduction of the decimal system (1793) into France the sou was abolished, and a piece of five centimes ($\frac{1}{20}$ of a franc) substituted; but the name continued in common use, and the old sous were retained in circulation. The solidus also appears in the *soldo*, which was a coin in use in some parts of Italy and was substantially the same as the sou.

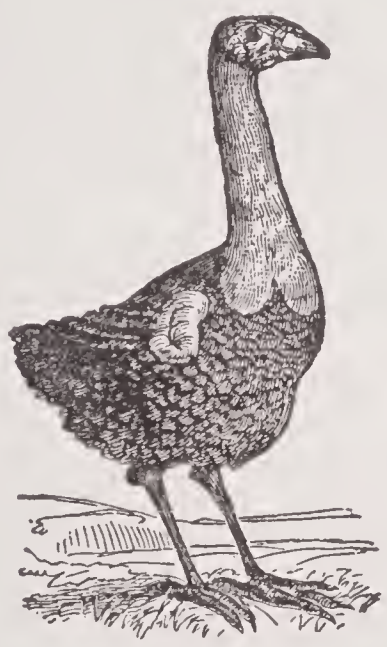
Solingen, a town of Prussia; 13 miles E. of Düsseldorf and not far from the river Wupper. Ever since the 12th or 13th century it has been famous for its steel and

iron ware, especially for sword blades, helmets, cuirasses, knives, scissors, surgical instruments, etc., which are exported to all parts of the world. These are made by the workmen in their own homes, and some 30,000 persons are employed in this industry throughout the district. Solingen has also iron foundries, cigar factories, etc. Pop. (1905) 49,006.

Solis, Antonio de (so'lees), a Spanish historian and dramatic poet; born in Placentia in 1610. He became secretary to Philip IV. and afterward entered into holy orders. He wrote many comedies and poems, but his great work is the "History of the Conquest of Mexico." He died in 1686.

Solis, Juan Diaz de, a Spanish navigator; with Pinzon discovered Yucatan in 1507, explored the Bay of Rio Janeiro in 1512, and learning from the natives that a great river (Paraguaya) existed further along the coast, he set sail for Spain and obtained the king's permission to make conquests on its banks. He returned to Rio Janeiro, and proceeding in a S. W. route, landed near a river between Realdonado and Montevideo; but was there killed by the Indians in 1515.

Solitaire, in ornithology, an extinct genus of *Didid*æ, with a single species, *Pezophaps solitaria,* from the island of



SOLITAIRE.

Rodriguez. It was described by Lequat in 1708 from personal observation, and probably survived till 1761. It was allied to the DODO (*q. v.*), but the neck and legs were longer, and the bird was more slightly built. They were formerly very abundant, and, being excellent eating, the early voyagers destroyed great numbers of them. The introduction of swine, which ran wild in the forests. and fed on the eggs and the young birds, completed their extermination.

Solitaire, a game played by one person on a board indented with 33 or 37 hemispherical hollows, with an equal number of balls. One ball is removed from the board, and the empty hollow thus left enables pieces to be captured singly as in draughts. The object of the player is to take all the pieces except one without moving diagonally or over more than two spaces at a time. The game may also be played with ordinary playing cards, the object being to so combine the cards that similar denominations may be grouped.

Solmization, the art of singing certain syllables to the notes of the musical scale, as opposed to the use of a vowel sound, such as *a* (*ah*), *e* (*ā*), *i* (*ē*), etc. The earliest known form in use among the Greeks was pronounced probably *ta, tĕ, tē, tō.* The basis of our present system is to be found in that of Guido d'Arezzo, in the 11th century, who named his six notes *ut, re, mi, fa, sol, la,* after the initial notes of a Latin hymn. This system was gradually superseded in the United States by the repetition of *fa, sol, la,* for the six notes of the scale, from any starting point, the syllable *mi* being reserved for the leading note only; thus, *fa, sol, la, fa, sol, la, mi, fa.* But where this system was not adopted the name *ut* was gradually rejected in favor of *do* in the United States, and *si* was the name given to the seventh degree. We now reach the seven recurring syllables, *do, re, mi, fa, so, la, si;* but about the middle of the 18th century, Boisgelou, a Frenchman, suggested the following chromatic series, do (or ut), *de,* re, *ma,* mi, fa, *fi,* sol, *fe,* la, *sa,* si. This idea has been improved and expanded in the Tonic sol-fa system as now used. The use of sol-fa syllables gives to the singer merely a rough notion of tones and semitones; it gives no clue to the mathematical ratios, or "proportion," of notes.

Solmona. See SULMONA.

Solo. See SOURAKARTA.

Solo, a term used in musical compositions of several parts, whether vocal or instrumental, to indicate a voice or instrument that is to perform alone or in a more prominent manner, as soprano solo, violin solo. The plural, soli, is used when two or more voices or instrumental parts are to be performed together, such parts, of course, never being doubled. A composition for a single instrument accompanied is also termed a solo.

Solomon (Hebrew, Shelomoh, the Prince of Peace), son of David, King of Israel, by Bathsheba, formerly the wife of Uriah, was appointed by David to be his successor in preference to his elder brothers. By his remarkable judicial decisions and his completion of the political institutions of David Solomon gained the respect and admiration

of his people; while by the building of the temple, which gave to the Hebrew worship a magnificence it had not hitherto possessed, he bound the nation more strongly to his throne. The wealth of Solomon, accumulated by a prudent use of the treasures inherited from his father; by successful commerce; by a careful administration of the royal revenues; and by an increase of taxes, enabled him to meet the expenses of erecting the temple, building palaces, cities, and fortifications, and of supporting the extravagance of a luxurious court. Fortune long seemed to favor this great king; and Israel, in the fulness of its prosperity, scarcely perceived that he was continually becoming more despotic. Contrary to the laws of Moses, he admitted foreign women to his harem; and from love of them he was weak enough in his old age to permit the free practice of their idolatrous worship and even to take part in it himself. Toward the close of his reign troubles arose in consequence of these delinquencies, and the growing discontent, coming to a head after his death, resulted in the division of the kingdom, which his feeble son Rehoboam could not prevent. The 40 years' reign of Solomon is still celebrated among the Jews, for its splendor and its happy tranquillity, as one of the brightest periods of their history. The writings attributed to Solomon are "The Book of Proverbs," "Ecclesiastes," and the "Song of Solomon," with the apocryphal book the "Wisdom of Solomon"; but modern criticism has decided that only a portion of the "Book of Proverbs" can be referred to Solomon. See SOLOMON'S SONG.

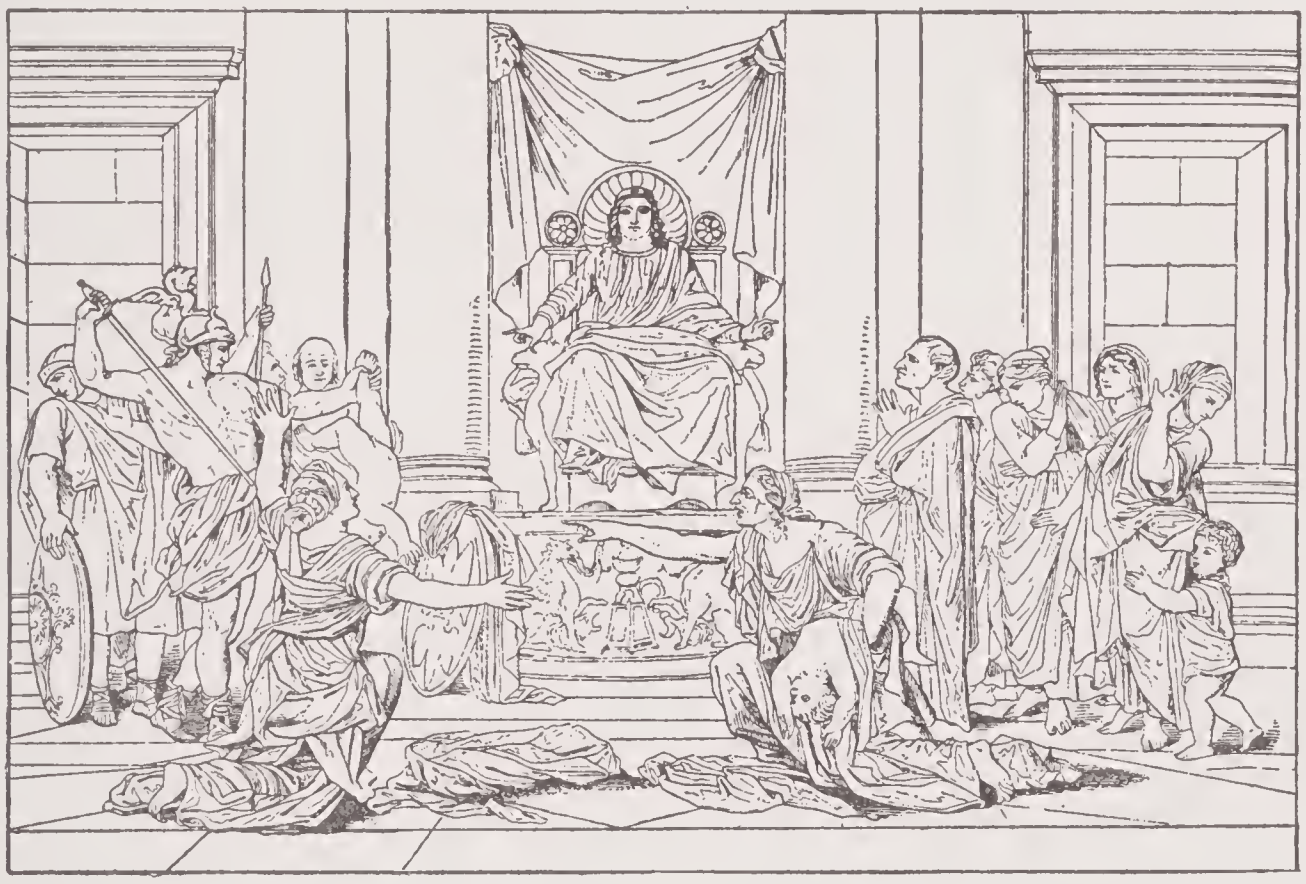
RAPHAEL'S BUILDING OF SOLOMON'S TEMPLE.

Solomon Islands, a group in the South Pacific; lying S. E. of New Britain and E. of New Guinea; extending in a S. E. direction between lat. 4° and 11° S., and long. 152° to 154° E. These islands were first discovered and explored by the Spanish navigator Mendana in 1568. He named them Solomon Islands on the imagined idea that the riches of Solomon's temple had been brought from them. While on his way to colonize them in 1595, he died, and the islands were not again visited till they were rediscovered by Carteret in 1767. They were visited several times during the latter part of the 18th century, and parts of the coast line of the larger islands were surveyed, but between 1794 and 1838, they became almost forgotten. After the latter date the survey of the coast was renewed, and both traders and missionaries endeavored to settle on the islands. Neither met with much success, however, and little was heard of the islanders save accounts of the

Solomon Islands

murders and plunders perpetrated by them. In 1845 some French missionaries went thither in charge of Mgr. Epaulle, a notable dignitary of the Church, but their leader was killed by the natives soon after landing. There is no doubt, from the accounts given, that the natives practised cannibalism. In 1848 the French mission was abandoned. Some 12 or 14 years later, the English Church established a mission on the islands, in charge of native teachers from other islands that had been Christianized. In 1881 the French Catholic mission was again resumed. There never has been any white settlement of any permanency on the islands.

The Solomon group is composed of seven larger islands, and a great number of small ones, the area of the whole being estimated at about 10,000 square miles. The shores of the group are generally low, and bordered in some places with mangrove swamps, but several of the islands are traversed in the interior by mountains of considerable height. Numerous streams flow from the hills and the tropical atmosphere is cooled with abundant rains. The soil is very fertile; bananas, yams, sugar cane, and ginger are cultivated, and the breadfruit, cacao and clove trees abound. The islands are mainly inhabited by negrillos though there are some Malays in the N. part. They are a small, sturdy race, with crisp, dark, wooly hair, projecting brows, deeply sunk eyes, short noses, and moderately thick lips. Of their manners and customs very little is known. They are broken into numerous clans which are almost constantly at war. They are cannibals, but to what extent they carry on this practice is unknown. They live in square, strongly built houses, with high, projecting roofs. Within they have floor mats on which to sit and sleep, and bowls from which to eat, but little else. Clothing is of the scantiest, both sexes being almost and sometimes wholly naked. Little is known of the form of religion practised, but the people seem to pay honor to departed spirits, and in villages there are large halls, called spirit houses, which are often decorated with taste and skill. The people show some ability in carving, also in the manufacture of their canoes and weapons of war. They also make girdles of beads or shells, and bracelets, combs, and head dresses of feathers, beads, or carved tortoise shell. They also make rude instruments of music, pan pipes and jewsharps, and show much fondness for music and dancing. They are much addicted to chewing the betelnut, and drink arrak, an intoxicating drink made from the palm tree. So far as their moral traits are concerned they are crafty, thievish, and revengeful, but are easily influenced by kindness and are grateful to those who treat them well. The British protectorate was extended in 1887–1898. In accordance with the Anglo-German agreement of 1899 the islands of Choiseul and Isabel, with their surrounding islets, were transferred to Great Britain, Germany retaining the islands of Bougainville and Buka.



RAPHAEL'S JUDGMENT OF SOLOMON.

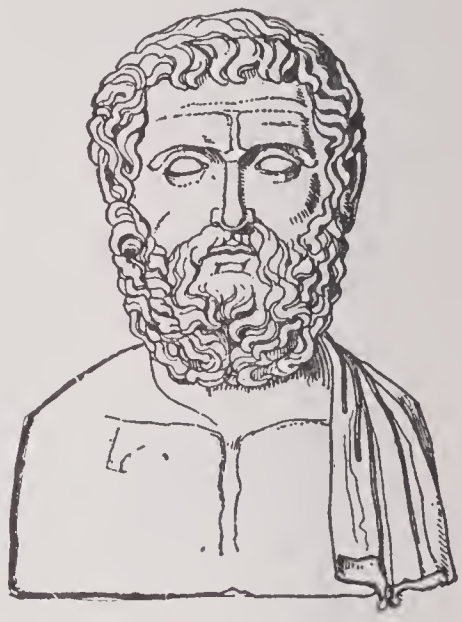
Solomon's Seal, in botany, *Polygonatum multiflorum*, and the genus *Polygonatum*. The stem is terete, and two to three feet high; the leaves, which are three to four inches long, are alternate, subbifarious, and secund; the peduncles with two to five flowers; the perianth is tubular campanulate, greenish-white; the berry blue-black. The young leaves have sometimes been eaten as vegetables.

ANGULAR STEMMED SOLOMON'S SEAL.

Solomon's Song, called also the SONG OF SONGS, or CANTICLES, one of the canonical books of the Old Testament. From the earliest period this book has been the subject of voluminous controversies. It seems to have been a recognized part of the Jewish canon in the time of Jesus. Till the beginning of the 18th century the author of the book was almost universally believed to be Solomon. Modern critics, however, attribute it to an author of Northern Israel, who wrote it about the middle of the 10th century B. C., shortly after the death of Solomon, in a spirit of protest against the corrupt splendor of the court of Zion. The unity of the poem is sufficiently evidenced by the continuity of names, characters, and subject, and is taken for granted by the majority of critics. The main subject of dispute has been as to its interpretation. The various theories in regard thereto are too numerous to specify; but they naturally fall into two classes, the literal and allegorical. The highest form of allegorical significance contended for is the mystical or spiritual interpretation, by which the whole poem becomes a figurative representation of the hopes and aspirations, together with the trials and difficulties, of a spiritual life. This interpretation, whether applied individually or collectively to the Church or nation of Israel, was almost universally received both by Jews and Christians till recent times. The most favored literal interpretation is that originally given by Jacobi, that the poem represents the temptation and triumph of virtuous love. The supporters of the allegorical interpretation of the book strongly urge the frequency with which the marriage relation is employed, both in the Old and New Testament, to represent the relation of Jehovah to Israel in the old, and of Christ to the Church in the new dispensation.

Solomon's Temple. See TEMPLE, SOLOMON'S.

Solon, one of the seven sages of Greece, and the celebrated legislator of Athens; born in Salamis, in the 7th century B. C. After having enhanced the glory of his country by recovering Salamis, he was chosen archon 594 B. C., and having received full power to do whatever he judged needful, he set himself to the task of improving the condition of his countrymen. He abolished most of the cruel laws of Draco, and formed a new constitution founded on the principle of making property, not birth, the title to the honors and offices of the State. He made many special laws also relating to trade and commerce, marriage, disposition of property by will, etc., caused them to be engraved on wooden cylinders, and is said to have bound the Athenians by an oath not to make any changes in his code for 10 years. He then left the country, to avoid being obliged to make any alteration in them, and visited Egypt, Cyprus, and Lydia. The beautiful story of his visit to the court of Crœsus, so celebrated in ancient times, is now numbered with other beautiful myths which can only be admired, not believed. On his return, after an absence of 10 years, he found the State torn by party violence, and his kinsman Pisistratus aiming at the sovereignty, which he soon seized. Solon then withdrew from public life and is supposed to have died at the age of 80, about 558 B. C.



SOLON.

Solor Islands, a group of four East Indian islands, lying E. of Flores. The chief are: Solor, area, 105 square miles; pop. 15,000; Adanara (or Adonare), area, 302 square miles; Lomblem, area, 520 square miles; Pantar, area, 275 square miles. The first three are inhabited by Malays, most of whom are Mohammedans; Pantar, by Papuans. Adonare is independent; the Dutch hold the others. The islands are fertile and their scenery picturesque. The natives on the coast engage much in fishing. The entire area is about 1,250 square miles; pop. estimated 40,000–180,000.

Solpugidea, in zoölogy, a tropical or sub-tropical order of *Arachnida,* with one family, *Galeodides* or *Galeodidæ,* containing five genera; *Rhax, Ællopus, Galeodes, Solpuga,* and *Gluvia,* characterized by the subdivisions of the tarsal joints of the second, third, and fourth pairs of legs. They are nocturnal in habits and extremely pugnacious, but it is doubtful whether they are venomous.

Solstice, in astronomy, the time when the sun is in one of the solstitial points — that is, when it is at its greatest distance from the equator — and is so called because he then appears to stand still, and not to change his distance from the equator for some time. There are two solstices in each year — the summer and the winter solstice. The former is when the sun seems to enter the tropic of Cancer, which is on June 21, the longest day; the latter solstice is when the sun enters the first degree, or seems to describe the tropic of Capricorn, which is on Dec. 22, the shortest day. This is only to be understood of the Northern Hemisphere, as in the Southern the sun's entrance into Capricorn makes the summer solstice, and into Cancer the winter solstice.

Solstitial Points, those two points in the ecliptic which are farthest from the equator, and at which the sun arrives at the time of a solstice. The distance of each from the equator is equal to the obliquity of the ecliptic, about 23° 27′.

Solution, in ordinary language, the act of separating the parts of any body; disruption, breach; also, the act of solving, explaining, answering, or clearing up, as a problem, question, doubt; the state of being solved, explained, answered, or cleared up; or, that which serves to solve, explain, answer, or clear up a problem, question, doubt, or the like, explanation, resolution.

In chemistry, a term applied to the product of the action, as well as the action itself, whereby a solid or gaseous body in contact with a liquid suffers liquefaction; or to the union of one liquid with another when each is capable of taking up only a limited quantity of the other. The solution of a solid in a liquid is usually attended with a fall of temperature, excepting where solution is preceded by the formation of a definite chemical compound. The solution of one liquid with another occurs without change of temperature, excepting in cases in which chemical union takes place, as in the dilution of sulphuric acid with water. The solvent power of liquids, with few exceptions, is increased by rise of temperature. In civil law, payment; satisfaction of a creditor. In mathematics, the operation of finding such values for the unknown parts as will satisfy the conditions of the problem. Problems may be solved algebraically or geometrically. The term is frequently used to denote the answer or result of the operation itself. In pathology, the termination of a disease, either with or without critical signs; applied also to a crisis. In pharmacy, a water preparation, either of inorganic substances or of certain definite active organic principles.

Solution of Acetate of Ammonia. See Mindererus Spirit.

Solway Firth, an arm of the Irish Sea, forming part of the boundary between England and Scotland, and extending inland in a N. E. direction for above 41 miles, with a breadth diminishing from 20 miles, at its entrance between St. Bees Head in Cumberland, and Rayberry Head in Kirkcudbrightshire, to 7 miles, and finally only to 2 miles. A large portion of the Solway is left dry at ebb tide. It abounds with fish and has several valuable salmon fisheries.

Solyman I., or **Suleiman,** the Noble, Emperor of Turkey, was proclaimed emperor after the defeat and capture of his father, Bajazet, by Timour, 1402. He was dethroned by his brother, Mousa, during a revolt of his subjects, and soon after killed, 1410.

Solyman II., surnamed the Magnificent; born in 1493, succeeded his father, Selem I., in 1520. Having concluded a truce with Ismael, sophi of Persia, and quelled a rebellion in Syria, he turned his arms against Europe. In 1521 he took Belgrade; and in the following year Rhodes fell into his hands after an obstinate defense. In 1529 he made himself master of Buda, and then laid siege to Vienna, whence he was obliged to retreat with the loss of 120,000 men. In 1534 he marched into the East, and took Tauris from the Persians, but was soon afterward defeated by the Shah. His forces were also repulsed before Malta; but he took the Isle of Chios in 1566. He was a poet, legislator, and warrior of eminent greatness for an Oriental. He encouraged arts and literature, made roads, bridges, erected noble mosques and public buildings, and superintended the compilation of an administrative code. He died in Szigeth, Hungary, in 1566.

Solyman III., became sultan on the deposition of his brother, Mahomet IV., in 1687. His life had been spent up to his 49th year, in the seraglio, where he had devoted himself to the study of the Koran. Under his weak rule the Turks were defeated in Hungary and in Servia. He died in Constantinople in 1691.

Somaj, Brahma. See Brahma-Somaj.

Somaliland, a country on the E. coast of Africa, bounded on the N. by the Gulf of Aden; on the E. by the Indian Ocean from Cape Guardafui to lat. 7° 45′ N. Its other

boundaries are indefinite. Two ranges of mountains traverse the peninsula S. E. to N. W., between which lies the Wadi Nogal, of which the natives speak in the most glowing terms. Several varieties of gum trees occur, and the mimosa, tamarisk, wild fig, and several species of the cactus and aloe are abundant. The wild beasts include the elephant, lion, leopard, hyena, wolf, and jackal. The Somâli are a fine race.

British Somaliland extends about 400 miles along the coast and 300 miles inland; area, 68,000 square miles; pop., 300,000; chief ports, Berbera, Zaila, and Bulhar.

French Somaliland lies between British Somaliland and the Italian colony of Erythrea; area, 46,000 square miles; pop., 208,-060; capital, Jibutil.

Italian Somaliland is separated from the East Africa Protectorate (British) by the Juba river, and has a coast line extending from the Juba to the Somali Coast Protectorate (British); area, 129,700 square miles; pop., 400,000; capital, Mogadisho.

Somateria, in ornithology, a genus of *Anatidæ*, with five species, from Arctic and sub-Arctic regions. Bill swollen and elevated at base; nostrils lateral, oval; legs short; feet of three anterior toes, broadly webbed; wings of moderate length; tail short.

Somatic Life, the name applied to the inherent vitality of the tissues and organs of the body, as distinguished from the more active sense in which the word "life" is applied to that of the organism as a whole.

Sombrerete, a town of Mexico, State of Zacatecas, 65 miles N. W. of the town of that name, is the center of a silver mining district said to have contained the richest metallic veins ever discovered, but now almost worked out. Pop. 14,000.

Sombrerite, a mineral (a phosphate of alumina and lime), remarkable for the large amount of phosphoric acid which it contains. It forms a large portion of some small islands in the West Indies, especially of Sombrero Island.

Sombrero Island, a small rocky British island midway between Anguilla and the Virgin group, West Indies. It has a lighthouse and large deposits of phosphate of lime.

Somers, John, Lord, an English statesman; born in Worcester, England, March 4, 1652. In 1667 he entered Trinity College, Oxford, in 1669 the Middle Temple, being called to the bar in 1676. Associated with the "Country party," he was one of the counsel for the Seven Bishops (1688), and from the Revolution onward took a prominent part in politics, being returned for Worcester to the Convention Parliament, and successively made solicitor-general, attorney-general, and Lord Keeper of the Great Seal, till in 1697 he became Lord Chancellor and was raised to the peerage as Baron Somers of Evesham. He was William's most trusted minister, and as such was the object of frequent attacks, one of which in 1700 resulted in his being deprived of the seal, and another in 1701 in an impeachment by the Commons, rejected, however, by the House of Lords. He returned for two years to power as president of the Council (1708–1710), and died of apoplexy, April 26, 1716. The "Somers Tracts" (16 vols. 1748), a valuable collection of state papers from his library, were reëdited by Sir Walter Scott (13 vols. 1809–1815).

Somerset House, a notable building in London, England, fronting both on the Strand and on the Thames Embankment; is on the site of a palace built by the Protector Somerset about 1549, which fell to the crown on Somerset's execution. The original edifice was pulled down and rebuilt in 1776–1786, after designs by Sir William Chambers, in the Palladian or Italian style. The building accommodates the offices of the Audit and Exchequer, Inland Revenue, Wills and Probate, and the Registry-General of Births, Deaths, and Marriages for England and Wales. The E. wing, built in 1828, accommodates King's College and School.

Somerset, Robert Carr, Earl of, a British politician; born in Scotland in 1589. He was at first a page to James I., and followed him to England when he succeeded Elizabeth in 1603. The king became greatly attached to him, made him treasurer of Scotland, and gave him a seat in the upper house with the title of Viscount Rochester, and then of Earl of Somerset. In the height of his greatness he married the divorced wife (with whom he had previously had an improper intimacy) of the young Earl of Essex, contrary to the advice of his friend and secretary, Sir Thomas Overbury. The countess never forgave Overbury for this; and on her suggestion he was sent to the Tower for some trivial offense, and after a few months dispatched by poison. The murder was discovered, and all the parties to it were condemned. The tools in the crime were executed, but Somerset and his wife were kept in the Tower. After a few years' imprisonment the unhappy pair obtained their freedom and spent the rest of their days in obscurity and disgrace. He died in 1640.

Somers Islands. See Bermudas, The.

Somerville, a city in Middlesex co., Mass.; on the Mystic river, and on the Fitchburg and the Boston and Maine railroads. It comprises nearly a dozen villages, and contains a public library, English and Latin high schools, Home of the Little Sisters of the Poor, a hospital, street rail-

roads, electric lights, National, savings, and coöperative banks, and several weekly newspapers. It has desk factories, iron foundries, tanneries, flour mills, tube works, and large slaughtering and meat-packing plants, and an assessed property valuation of over $53,000,000. The city is built on seven hills, some of which were fortified during the Revolutionary War, and the remains of some of the structures are still preserved, including the "old powder house" on Quarry Hill. The city is now a residential section for many Boston business men. Pop. (1900) 61,643; (1910) 77,236.

Somerville, Mary Fairfax, a Scotch astronomer and scientist; born in Jedburgh, Scotland, Dec. 26, 1780. She was elected a fellow of the Royal Astronomical Society. She published: "Mechanism of the Heavens" (1830), a translation of Laplace's "Mécanique Céleste," made at the request of Lord Brougham; "Connection of the Physical Sciences" (1834); "Physical Geography" (1849); "Microscopical and Molecular Science" (1869). She died in Naples, Nov. 29, 1872.

Somervillite, a mineral occurring in three distinct varieties: (1) A thin, green, transparent incrustation. (2) Bluish-green, earthy, light, becoming transparent when immersed in water. (3) Pale greenish-blue and sufficiently hard to take a polish. Composition: Variable, but is essentially a hydrated silicate of copper mixed with free silica.

Sometsuki Ware, a species of Japanese porcelain decorated under the glaze with ornaments in a blue pigment obtained from cobalt ore. It is made principally for domestic use. Another kind, manufactured at Hizen for the foreign market, bears colored enamels fused on the glaze.

Somme, a river of France, which rises in the department of Aisne, 7 miles N. E. of St. Quentin; flows S. W. into the department of the Somme and falls into the English Channel about 15 miles beyond Abbeville; length, 150 miles.

Sommers, Richard, an American naval officer; born in Egg Harbor, N. J., in 1778; was appointed to the navy in April, 1798, and sailed from Philadelphia in the frigate "United States" in July following, along the E. coast to the West Indies in search of French cruisers. In the war with Tripoli he was appointed to command the schooner "Nautilus" under Preble and was the first to arrive at Gibraltar. He participated in the first and second attacks on Tripoli in command of a division of gunboats; was promoted commander Feb. 16, 1804; proposed to destroy the Tripolitan fleet by exploding the "Intrepid" in its midst; and was killed in the attempt, Sept. 4, 1804.

Somnambulism, literally, the act or practice of walking in sleep; but, in a wider and more usual sense, that state of sleep or unconsciousness in which the mind retains its power over the limbs, but has no influence over its own thoughts. The controlling power of the will over the current of thought is entirely suspended, all the actions being directly prompted by the ideas which possess the mind. In some cases there is a coherent sequence in the succession of ideas, through which some one dominant impression may be traced, while in other instances it is more or less completely determinable by external suggestions. Among the various curious phenomena connected with this state, not the least remarkable is the peculiar power which suggestions derived from the muscular sense have in determining the current of thought. Thus, if the face, body, or limbs be brought into an attitude that is expressive of any particular emotion, the corresponding mental state is called up in correspondence to it; as, for instance, if the angles of the mouth be gently separated from one another, as in laughter, a hilarious disposition is immediately generated; and this may be made to give place to moroseness by drawing the eyebrows toward each other, and downwards upon the nose, as in frowning. In somnambulism proper, the individual gets out of bed, dresses himself, if not prevented; goes out of doors; walks frequently over dangerous places in safety; sometimes escapes by a window, and gets to the roof of a house; after a considerable interval returns, and goes to bed; and all that has passed conveys to his mind merely the impression of a dream. Frequently, during the paroxysm, the individual recollects circumstances which occurred during a previous attack, though there was no remembrance of them during the interval. It is unnecessary to speculate regarding the nature and cause of phenomena so obscure and so little understood.

The same observations may apply to clairvoyance, or that state of mesmeric somnambulism that in certain cases is said to enable its possessor to see absent objects, to know of things which he has never seen, and other phenomena of a not less extraordinary character. According to the actual state of scientific observation, neither magnetic influence or nervous fluid passes from the operator to the person operated on; in which case clairvoyance would be simply an effect of delusion. Thus, when we see science so far powerless to explain the common phenomena of ordinary somnambulism, we see no sound reason for declaring that mesmeric somnambulism has no real foundation whatever.

Somnauth Pattan ("the town of the lord of the moon"), a town on the S. W.

coast of the peninsula of Kattywar, India, in the native State of Soreth; 210 miles S. W. of Ahmedabad, and 163 W. of Surat. It is celebrated as one of the 12 original seats of Siva worship in India, and for the temple destroyed by Mahmud of Ghuzni in 1025. The town is still strongly fortified, and chiefly inhabited by Mohammedans, who have erected many mosques. The ruins of the great temple indicate its former grandeur, and the spot has recently revived as a place of pilgrimage. The name is known in modern history on account of the proposal of Lord Ellenborough in 1842 to restore the sandalwood gates of Somnauth from the tomb of the conqueror of Ghuzni, "avenging the insult of 800 years." Certain gates were actually carried from Afghanistan to Agra, where they now lie, as their progress was stopped by order of the home government. That they are the original gates of Somnauth, however, has been strongly denied.

Somnus, in Roman mythology, the son of Erebus and Nox, and one of the infernal deities, who presided over sleep. According to Hesiod his palace is a dark cave where the sun never penetrates. At the entrance are a number of poppies and somniferous herbs. The god himself is represented as asleep on a bed of feathers, with black curtains. The Dreams stand by him, and Morpheus, as his principal minister, guards his slumbers from interruption.

Sonata, a term originally applied to any kind of musical composition for instruments, as distinguished from vocal compositions, which were called cantatas. It is now, however, confined to compositions for solo instruments, generally the pianoforte. The term sonata or suonata, as applied to a musical composition, was first used about the beginning of the 17th century. Those of that time so called had but one movement; they were in fact simply airs arranged in parts for an instrument or instruments. A modern sonata is generally constructed upon the following plan: The first movement is an allegro, sometimes with an introduction, but more frequently without one; the second, "the slow movement," is set in any time, between adagio and andante; and the final movement is an allegro. See CONCERTO.

Sonderbund, a name given to the league formed in 1846 by the seven Roman Catholic cantons of Switzerland against the Federal Diet, which had decreed the expulsion of the Jesuits. The Diet voted the Sonderbund illegal, July 20, 1847. Freiburg, their stronghold, was captured Nov. 13, Lucerne, Nov. 24, and the Sonderbund was dissolved.

Sondeli, the *Sorex murinus,* a species of shrew mice, also named the mondjouron, and muskrat of India. It exudes a strong odor of musk from the inguinal or abdominal glands. Though named "muskrat," it is not a true rat, belonging to the order *Insectivora;* yet it is rat-like in form and size. Its fur is a chestnut hue above and gray beneath.

Song, a little poem intended to be sung; a lyric. The term is applied to either a short poetical or musical composition, but most frequently to both in union. As a poetical composition a song may be defined as a short poem divided into portions of returning measure, and turning upon some single thought or feeling. As a union of poetry and music, it may be defined as a brief lyrical poem, founded commonly upon agreeable subjects, to which is added a melody for the purpose of singing it. As denoting a musical composition it is generally confined to an air for a single voice — airs for more than one voice being, however, sometimes called part songs.

Song-Ka. See RED RIVER.

Songs, Popular. See POPULAR SONGS.

Sonnenthal, Adolph Ritter von, a German tragedian; born in Pest in 1834. Owing to financial reverses his parents were not able to give him the course at the Polytechnic School they had intended, and he was apprenticed to a tailor. After serving his apprenticeship he started out with his pack on his back as a journeyman and walked to Vienna. Arriving there he saved up enough money to buy a cheap seat in the Burg theater. This proved the starting point in his wonderfully successful career; for seized with the ambition to become an actor he applied for a position. After serving for a time as a supernumerary the manager advised him to go on as a regular actor. This advice he followed, with the result that he became the greatest living exponent of the German drama. He made two visits to the United States.

Sonnet, a species of poetic composition first brought into notice by Petrarch, and consisting properly of 14 iambic verses of 11 syllables. It is divided into two chief parts, each consisting of two divisions — in the former, each comprising four lines (quatrain); in the latter, three (terzina). The quatrains have two rhymes, each of which is repeated four times; and in the common Italian form the rhymes are the first, fourth, fifth, and eighth verses, and the second, third, sixth, and seventh; but several other forms are also adopted. In the two terzine, there are either three rhymes each twice repeated, or two rhymes thrice repeated in all positions. The sonnet generally contains one principal idea pursued through the various antitheses of the different strophes, and adorned with the charm of rhyme. Italy and Spain are the countries

in which the sonnet is most cultivated, the lightness and flexibility of their languages being eminently suited for such compositions.

Sonometer, in acoustics, an instrument devised by Marlowe for determining the number of vibrations made by a string emitting any musical sound. It is provided with a series of weights, to vary the tension of the central string, the others being tuned by pegs, and has three divided scales, one corresponding to the modified chromatic gamut, another to the true chromatic gamut, and the third the French meter divided to thousandths. Also an instrument for testing the hearing capacity of a patient. It consists of a small bell on a table, caused to make a definite number of vibrations in a given time. In electricity, a form of the induction balance, which may be used for testing the sensitiveness of hearing, comparing resistances, measuring the sensitiveness of telephones, etc.

Sonora, a frontier State in the N. W. of Mexico; on the Gulf of California; is the second largest in the republic; area, 76,900 square miles. The coast is flat and sandy, the interior filled with wooded mountains and fertile valleys. Malaria is mostly confined to one part of the coast. Here the climate is hot, but in the mountains there is frost for five months in the year. The chief rivers are the Sonora, Yaqui, and Mayo. The principal wealth of the State is in its minerals, especially gold, silver, mercury, and iron. Agriculture, wine growing, and cattle rearing are also successful, and cottons, hats, shoes, and soap are manufactured. Pop. (1900) 221,682. Capital, Hermosillo; chief port, Guaymas.

Sonoran Heloderm. See GILA MONSTER.

Sonorous Figures, in acoustics, figures formed by the vibrations produced by sound. If the bow of a violin be drawn across the edge of a plate of glass covered with any fine powder, the powder will form figures standing in a certain relation to the tone sounded. The figures depend on the nodal lines formed by the vibrations of the plate. Called also acoustic figures and sound figures.

Sons of America, Patriotic Order of, a society first organized in Philadelphia in 1847, as the "Junior Sons of America," and afterward reorganized under its present name. Its objects are principally patriotic and benevolent, and its membership is confined to male persons "born on the soil or under the jurisdiction of the United States of America."

Sons of Liberty, an association of the colonists of North America, called into existence by Lord Grenville's "Stamp Act." They combined to throw off the allegiance to Great Britain and make North America independent. The association began in New York and Connecticut. The term "Sons of Liberty" was suggested by a speech of Colonel Barré's. Also a secret organization opposed to the prosecution of the war for the maintenance of the Union (1861–1865). It was suppressed by military commission in 1864.

Sontag, Henrietta, a German soprano singer; born in Coblentz, Prussia, May 13, 1805. Sprung from a theatrical family, Henrietta was the favorite prima donna of the Berlin stage before she was 18. She soon rose to the foremost place among European vocalists. In Paris, where she went in 1828, and afterward in London, her youth and beauty, her fresh and lovely voice, and the high, finished, exquisite purity of her style, produced universal delight. About 1830 she married Count Rossi, a Piedmontese nobleman, and left the theater. Her virtues, her manners, and her accomplishments made her everywhere acceptable in the highest circles. But she never lost her love for her art, and continued to make progress as an artist in the midst of all the enjoyments of high life. After a happy union of nearly 20 years her husband became involved in the political troubles of 1848 and lost his fortune. Without hesitation she resolved to have recourse to her art for the sake of her husband and her children. She sang for several seasons in Europe, and came to the United States in 1852. After a brilliant and successful tour through the Union, she accepted a tempting offer from Mexico, where she was cut off by cholera, June 17, 1854.

Sonthals, an aboriginal hill tribe found in Southern Bengal, India, who have attracted considerable attention. Their physiognomy is distinctly of a negroid type, but their philological and ethnical affinities have not been definitely ascertained. The Sonthals are a nomad race, with little affection for home, but a strong reverence for mountains and rivers. They supply a large portion of the hired labor of the plains, especially in indigo factories. In 1855, owing to the exactions of Hindu landlords and money-lenders, they broke into an armed rebellion which required to be repressed by vigorous measures. At the same time the tract where they are most numerous was formed into a new district, with exceptional regulations, called the Sonthal Pergunnahs; area, 5,488 square miles; pop. (1901) 1,790,000, of whom 850,000 are in British territory. The district of the Sonthals covers the Rajmehal hills, and is also peopled by another aboriginal tribe of Pahariya Mals. The chief towns are Sahibgunje and Rajmehal, both on the Ganges, where the river traffic is transferred to and from the railway. The capital is Dumka.

In the last few years the Sonthals have shown a tendency to adopt Hinduism in its entirety. A few are Christians.

Soochoo. See SUCHAU.

Soodra, or **Sudra,** the fourth caste in the old Hindu social system. It contained the laboring classes. It has now split into a large number of distinct castes, perhaps a hundred existing in any ordinary locality. For instance, goldsmiths, blacksmiths, carpenters, etc., are not merely distinct callings but distinct castes. See CASTES.

Sooloo Isles. See SULU.

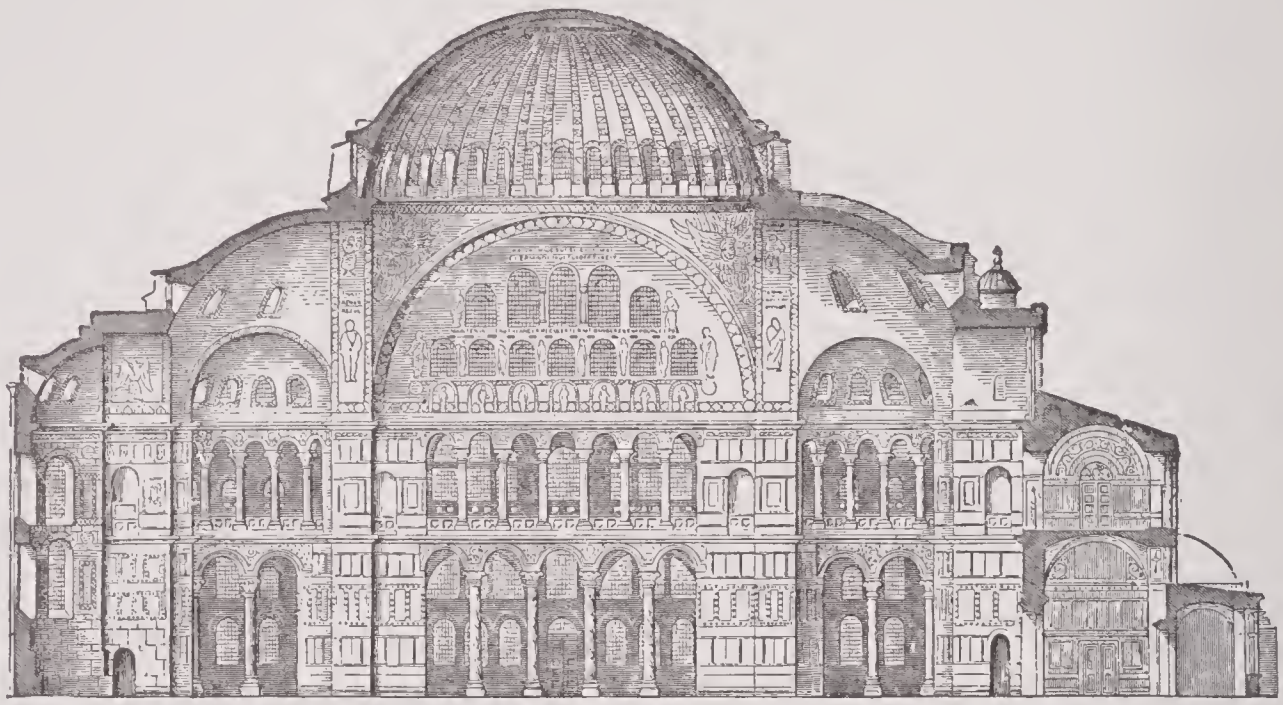
Sooranjee, or **Morindin,** a drug used for dyeing, prepared from the root of the *Morinda citrifolia*. See MORINDA.

Soosoo, the *Platanista Gangeticus,* otherwise known as the gangetic dolphin; a species of *Cetacea,* belonging to the dolphin family. It differs from other members of its group in inhabiting fresh waters, being found in the Ganges. It attains a length of 10 or 12 feet, has a very prominent and slender muzzle armed with numerous teeth, has small eyes, and a blowhole in the form of a vertical slit. The flesh is described as palatable. It is not eaten in India, but the fat is in repute for its medicinal qualities.

Soot, a black substance formed by combustion, or disengaged from fuel in the process of combustion, rising in fine particles and adhering to the sides of the chimney or pipe conveying the smoke. The soot of coal and that of wood differ very materially in their composition, the former containing more carbonaceous matter than the latter. Coal soot contains substances usually derived from animal matter; also sulphate and hydrochlorate of ammonia; and has been used for the preparation of the carbonate. It contains likewise an empyreumatic oil; but its chief basis is charcoal, in a state in which it is capable of being rendered soluble by the action of oxygen and moisture; and hence, combined with the action of the ammoniacal salts, it is used as a manure and acts very powerfully as such. The soot of wood has been minutely analyzed and found to consist of 15 different substances, of which ulmin, nitrogenous matter, carbonate of lime, water, acetate and sulphate of lime, acetate of potash, carbonaceous matter insoluble in alkalies, are the principal.

Sooty Tern. See EGG BIRD.

Sophia, Empress of Constantinople, niece of Theodora, and wife of Justinian II., with whom she shared in the government of the state. After the death of that prince in 578 she conspired against Tiberius Constantine, who had been raised to the throne by her advice, and, being defeated by him, was compelled to live in privacy.



CHURCH OF ST. SOPHIA.

Sophia, half-sister of Peter the Great, and Czarina of Russia; born in 1667; in 1682 she placed herself at the head of the revolt of the Strelitz. Having succeeded in her ambitious designs, she reigned over the Muscovites under the names of her brothers, Peter and Ivan. The former (Peter the Great), however, finally possessed himself of the sole power; and Sophia died a prisoner in a convent in 1704.

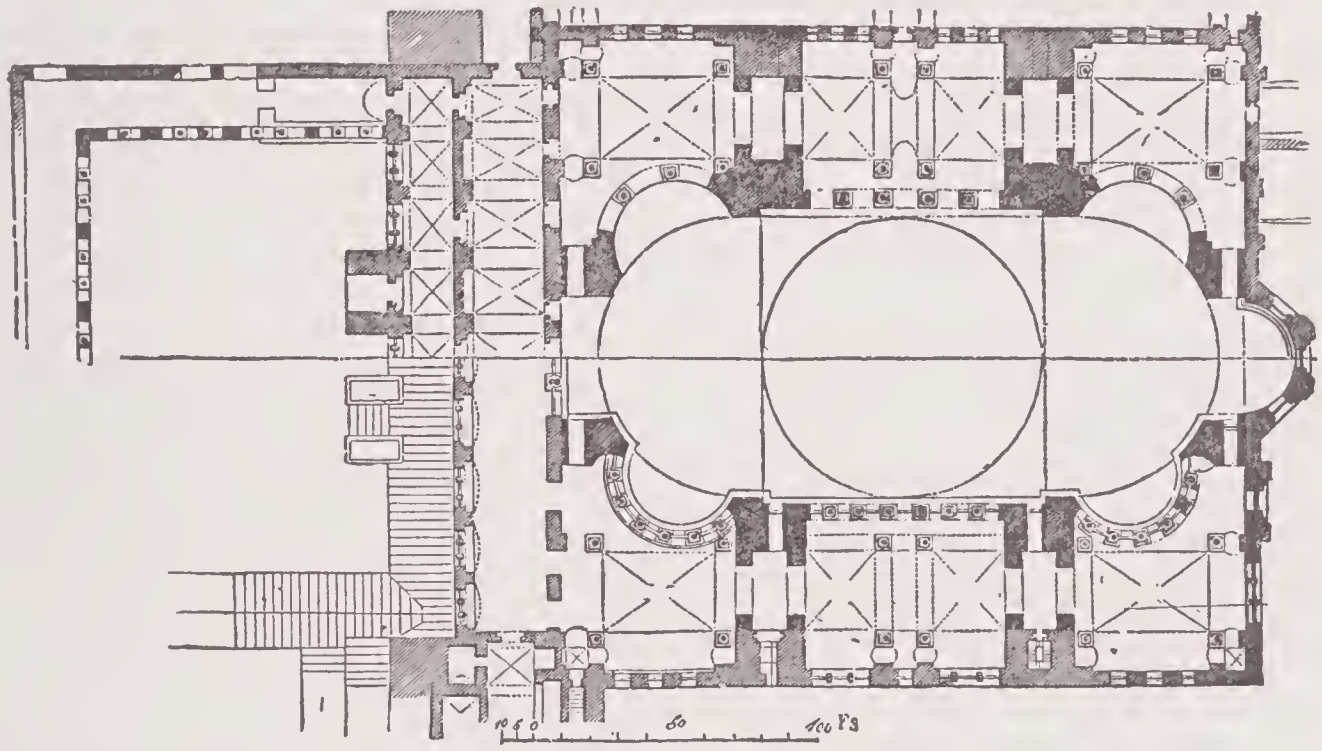
Sophia, Church of St., in Constantinople, the most celebrated ecclesiastical edifice of the Greek Church, now used as a mosque; was built by the Emperor Justinian, and dedicated in 558. It is in the Byzantine style of architecture, has a fine dome rising to the height of 180 feet, and is richly decorated in the interior. With the principal dome are connected two half domes and six smaller ones, which add to the general ef-

fect. The mass of the edifice is of brick, but is overlaid with marble; the floor is of mosaic work, composed of porphyry and verd antique. The great piers which support the dome consist of square blocks of stone bound with hoops of iron. The numerous pillars supporting the internal galleries, etc., are of white and colored marbles, porphyry, granite, etc., and have capitals of various peculiar forms. The interior of the church is 243 feet in width from N. to S., and 269 in length from E. to W., and its general effect is singularly fine.

Sophie Alberti. See VERENA, SOPHIE.

Sophists. The Greek word *sophistes* (from *sophos* = "skilled," "wise") meant originally any one of acknowledged or professed skill; thus, the term was applied to the seven sages (whether philosophers, like Thales, or statesmen, like Solon), to poets, musicians, etc. In the 5th and 4th centuries B. C. it came to be applied specially to those who made a profession of teaching all or any of the higher branches of learning. The great intellectual awakening of Athens after the Persian War, and the growth of democracy in Sicily and elsewhere, as well as at Athens, which gave skill in public speaking a new importance, led to the demand for an education which should go beyond the old training in "gymnastic" and "music" (*i. e.*, reading, writing, singing, and reciting from the poets). To meet this demand there arose a class of professional teachers, wandering scholars, who undertook to provide what we should call "higher education." This new movement presents certain resemblances to the rise of the universities in the 13th century, to the popularizing of learning and science in the 18th and 19th centuries, to the "University Extension" movement of today.

Some of the "Sophists" were more specially teachers of rhetoric — *i. e.*, they gave particular attention to the form of public speaking, and as such they are the beginners of Greek prose style. Originally artistic expression takes the form of verse. The poet is the "maker," the artist in language; prose is simply "ordinary speech." But from the time of the rhetoricians, such as Gorgias of Leontini, prose also becomes an art. The first effect of the deliberate pursuit of artistic form in prose was to produce a pedantic and artificial style. But this attention to language was the preparatory training for the simple beauty of the best Attic prose. Other Sophists gave more attention to the matter of public speech — the questions of right and wrong which come before law courts and political assemblies — and in this way they were the beginners of moral and political philosophy.



GROUND PLAN OF CHURCH OF ST. SOPHIA.

The earlier Greek philosophers, with the partial exception of the Pythagoreans, had hardly treated of human matters; they had been ontologists and cosmologists. Protagoras of Abdera and Prodicus of Ceos may be taken as famous and favorable examples of the professors of "virtue." It must be remembered that the teacher of conduct and the moral philosopher were not distinguished even by Plato and Aristotle. Other Sophists, like Hippias of Elis, professed to teach universal knowledge — what we call "general culture." Others again, like Euthydemus and Dionysiodorus (who appear in Plato's dialogue named after the first of them), devoted themselves specially to the art of disputation, and thus prepared the way for the science of logic.

Sophists

The ambitious youth of Athens flocked to a fashionable Sophist from intellectual interest in the new learning and in order to acquire an education which would fit them to obtain success in the law courts and in the popular assembly, or to acquit themselves with distinction in a discussion on any subject whatever. The various Sophists naturally differed much from each other in ability, in character, and in the degree of seriousness with which they regarded their function as teachers; and some may very well have deserved the censure expressed in Aristotle's definition of the Sophist as "a man who makes money by sham wisdom." In the eyes of old-fashioned persons the whole class was regarded with suspicion; the skill of the clever orator or disputant seemed to have something immoral about it, because it might enable the worse cause to appear the better. And to discuss the nature of right and wrong, or to theorize about the foundations of society, was then, as in other ages, regarded as dangerous.

In the eyes of such persons Socrates and Plato were "Sophists" just as much as the rest. though Socrates and Plato, conscious of their own intellectual honesty and earnestness, and not teaching for "pay," disowned the title. When the various branches of the new learning came to be differentiated, we find the rhetorician ISOCRATES (*q. v.*), to whom the term would certainly be applied by the average Athenian and by Plato, applying the term to Plato, but not to himself. Again, whereas Plato applies it to Protagoras, Gorgias, Hippias, etc., we find that Aristotle in a passage where he speaks disparagingly of the Sophists contrasts Protagoras with them. The word had come to acquire an evil connotation, such as survives in our use of the term "sophistry." But it is quite a delusion, as was conclusively shown by Grote ("History of Greece," pt. ii. chap. 67), to suppose that the Sophists were a sect of philosophers, with pernicious principles, who systematically undermined the morality of the Hellenic world. They were not a sect, but a profession; and on the whole they were neither better nor worse than their age. Like the journalist or litterateur of our own time, they succeeded by supplying what the public wanted. The Platonic Socrates, their adversary, himself says, "Our youth are corrupted, not by the individual Sophists, but by the public, which is the great Sophist, against whose influence any private teacher wages an unequal contest" ("Republic," vi. 492).

There is no common "Sophistic" doctrine. Different Sophists were influenced by different schools of philosophy. They were the popularizers of older doctrines. Thus, Protagoras was influenced by Heraclitus, whose doctrine of universal flux gives a basis for Protagoras's assertion of the absolute relativity of knowledge ("man is the measure of all things"; nothing is true but the sensation of the moment). The alleged influence of his fellow townsman, Democritus, seems less likely; for Democritus was about 20 years younger. Still the Atomist resolution of all things into mere arrangements of the only real existences (the atoms and the void) very likely helped to supply a basis for the distinction between "convention" and "nature," which was much used by some Sophists and became a commonplace of the period. Gorgias is said to have been a disciple of Empedocles, and was certainly influenced by the Eleatics. His paradoxical treatise on "Nature or the non-existent" is clearly a skeptical working out of the Eleatic principle of the unreality of the manifold. We have no sufficient knowledge to justify the attempts made by some German scholars to classify the Sophists according to different philosophical schools; and it is, moreover, unlikely that popular philosophers should admit of any very precise affiliation. We can only group them in a very rough way, such as has been attempted above. Some historians of philosophy (*e. g.*, Zeller and Ueberweg) lay stress on the distinction between the earlier and later Sophists, considering the "later Sophists" (such as Polus of Agrigentum, a pupil of Gorgias, Thrasymachus of Chalcedon, Euthydemus, etc.) to represent a distinct degeneracy in the class. This, however, seems doubtful except in the sense that, as time went on, "rhetoricians" and "philosophers" came to be more clearly differentiated from among the mass of the profession; and the name Sophist degenerated as we have seen. Professor Sidgwick has argued that the "Eristic" or disputatious Sophists are really a degenerate offshoot of the Socratic school; but against this hypothesis there are many objections.

While Grote is perfectly correct in holding that the Sophists are not a sect and have no common doctrine, he errs in ignoring the fact that they represent a common tendency, the new spirit of the age. The awakening of reflection on political and social institutions, on morals and religion, and the wider diffusion of enlightenment produced in Hellas the same spirit of "freethinking," individualism, and skeptical criticism which we find among the "Humanists" of the Renaissance, and still more among the English "Deists" and French "Encyclopædists" of the 18th century. Of this intellectual movement the Sophists were at once the outcome and the leaders. The differences between the Sophists might be paralleled by the differences between Voltaire, Diderot, Rousseau, etc., and yet all these writers share a common tendency. The very opinions maintained by certain

Sophocles

Sophists reappear in more fully developed forms among English and French writers of the 17th and 18th centuries. Thus, Thrasymachus, in Plato's "Republic," bases right simply on the command of the stronger, by which he means the sovereign power in the state — the theory of Hobbes, developed afterward in its legal aspects by Bentham and Austin. From the second book of Plato's "Republic" it appears that the Social Contract theory had already been propounded, almost certainly by some Sophist. Aristotle ("Politics," iii. 9) quotes Lycophron the Sophist as holding that government was only concerned with the protection of individual rights. Alcidamas, the rhetorician, maintained that "God made all men free; nature has made none a slave." This and similar sentiments, which we may call "Sophistic," in the sense that they belong to the new rationalism, are to be found frequently expressed in the extant plays and fragments of Euripides. Even Herodotus, though his style is unaffected by the rhetorical schools, has also imbibed a certain tolerant skepticism which appears in his treatment of the diversity of customs and religious beliefs; and the debate about the best form of government (iii. 80–82), which he unhistorically puts into the mouth of Persians, is probably due to a "Sophistic" source, and may indeed be called the earliest piece of Greek political philosophy that has come down to us. Much of the teaching of the Sophists was undoubtedly destructive of the old fabric of Greek belief and of Greek society, which rested on the narrow basis of an exclusive citizen caste with a substructure of slavery. The modern student will not necessarily think the worse of the Sophists on that account; though the majority of them were probably by no means conscious of the significance of the critical weapons they handled. By raising problems in almost every department of thought for which they could find no satisfactory answers, they prepared the way for the great period of Athenian philosophy (see SOCRATES). In later times the term "Sophist" came into reputation again; and some of the Greek professors of rhetoric under the Roman empire were described as Sophists on their tombs.

Sophocles, a Greek tragic poet; born in the Attic demus or village of Colonus, 495 B. C., 30 years later than Æschylus. He received a good education, and at an early age gained the prize in music and gymnastics. He was 15 when the battle of Salamis was fought, and for his remarkable beauty and skill in music he was chosen to lead the chorus which sang the pæan of victory. His first appearance as a dramatist was in 468, when, under memorable circumstances, he had Æschylus for his rival and won the victory. Of the next 28 years of his life nothing is recorded; but it is known that he made poetry his business, and that he composed a great many plays during that period. Not one of them, however, is now extant. The "Antigone," the earliest of his extant tragedies, was brought out in 440, and won the prize. The number of plays attributed to him without question was 113, of which 81 were probably produced after the "Antigone." Seven only are extant, viz., "Antigone," "Electra," "Trachinian Women," "King Œdipus," "Ajax," "Philoctetes," and "Œdipus at Colonus." These exhibit his art in its maturity, and sustain the verdict of ancient and modern critics that Sophocles carried the Greek drama to its highest perfection. He effected a complete change in the constitution of tragedy as Æschylus left it; loosening the connection between the parts of the

SOPHOCLES.

trilogy and the satiric drama, and making them not one great poem, but four distinct ones; introducing a third actor; and for subjects selecting, not a series of heroic and mythical actions, but for each play one leading fact of real human interest and lasting significance. Sophocles lived to be nearly 90, and in his latest years most probably wrote the "Œdipus at Colonus," so full of sweetness and tender melancholy, and consoling hopes, which was not presented on the stage till five years after the poet's death, 406 B. C.

Sophocles, Evangelinus Apostolides, a Grecian scholar and educational writer; born in Tsangaranda, Thessaly, Greece, March 8, 1807. Coming to America in 1829, he became Professor of Ancient, Modern, and Byzantine Greek in Harvard University in 1860. Among his publications are:

"Romaic Grammar" (1842; 2d ed. Boston, 1857; London, 1866); "Glossary of Later and Byzantine Greek" (1860, forming vol. vii., new series of "Memoirs of the American Academy"); and "Greek Lexicon of the Roman and Byzantine Periods," his most important work (1870). He died in Cambridge, Mass., Dec. 17, 1883.

Sophora, the typical genus of *Sophoreæ.* Leaves unequally pinnate, inflorescence in racemes or panicles of yellow, white, or blue flowers; stamens 10, all distinct; legumes moniliform, without joints or wings. Ornamental shrubs or trees, from the hotter parts of Asia and America. Two, *Sophora japonica* (called also *Styphnolobium japonicum*), and *S. chinensis,* are grown in European gardens. The former yields a beautiful yellow or orange dye from the pulp of the legumes. The roots and seeds of the latter have been regarded as specifics in bilious sickness.

Soprano, the highest register of female voices. Its ordinary range is from C below the treble staff to A above it, though some sopranos may go as high as E. The mezzo-soprano register is from A to F, that is, a third lower than the soprano, and a true mezzo-soprano voice has a deeper quality than a soprano.

Soracte, a celebrated mountain of Italy, 27 miles N. of Rome, now called Monte Sant' Oreste; height, 2,420 feet.

Sorata, or **Illampu,** one of the highest of the Andes, a volcanic cone in Bolivia, on the E. side of Lake Titicaca; height, 21,484 feet.

Sorbamide, in chemistry, $H_2(C_6H_7O)N$, an amide produced by the action of aqueous ammonia on sorbic ether at 120°. It forms white fusible needles, soluble in water and alcohol.

Sorbanilide, phenyl-sorbamide; formula, $C_6H_8(C_5H_5)NO$; produced by the action of aniline on sorbic chloride, as an oil which solidifies in the crystalline form.

Sorb Apple, the fruit of the service tree. See SERVICE TREE.

Sorbin, in chemistry, $C_6H_{12}O_6$, a sugar, discovered by Pelouse, isomeric with glucose, and obtained from the fermented juice of the mountain ash berries. It does not exist ready formed in the berries, and its formation is not yet clearly understood.

Sorbite, an unfermentable sugar present in berries of the mountain ash; formula, $C_6H_{14}O_6$. It is isomeric with mannite and dulcite, and deposits in regular transparent crystals, for the most part rhombic octahedrons, from the expressed juice after standing for several months. It is nearly insoluble in cold alcohol, moderately soluble in boiling alcohol, the hydrated sugar melts at 102°, is inactive to polarized light, does not reduce copper salts, nor is it carbonized with sulphuric acid even with heat.

Sorbonne, an establishment founded at Paris in 1253 by Robert de Sorbon, chaplain to St. Louis, for certain secular priests, who should devote themselves to the study of and gratuitous instruction in theology. Directed by its founder, who also compiled statutes, it bore at first the title of Collegium seu Congregatio pauperum Magistrorum Studentium, and comprised two kinds of members — foundationers, with the right of residence and a vote in the management of the college, and hospitallers or mere associates. It dispensed the three degrees of bachelor, licentiate, and doctor, a candidate for the last of which must for 10 years have held various disputations, including a final one maintained without food or rest against 20 opponents from 6 in the morning till 7 o'clock at night. The celebrity of its doctors, the crowds of scholars who sought its degrees, gave the Sorbonne a European fame, which steadily grew from the 14th to the 17th century, from a branch of the theological faculty, it became the faculty itself; its voice was paramount in matters of faith. But after the deathblow dealt it by JANSENISM (*q. v.*) its only sign of life was vain anathemas hurled against the philosophers of the 18th century; and in 1789 it was suppressed with the other ecclesiastical foundations. The buildings, enlarged and beautified in 1629 by Richelieu, who is buried in the Sorbonne Chapel, are at present occupied by the Académie Universitaire de Paris, and by the faculties of letters, sciences, and theology.

Sordello (sor-del'lō), an Italian poet; born in Goito, near Mantua, about 1180. He composed poems in the language of Provence, of which 34 remain. One of the most celebrated passages in Dante is on the subject of this poet, and Browning's "Sordello" (1840) is founded on the story of his life. He died about 1255.

Sordino, in music, a mute used in musical instruments to damp or deaden the sound. When the mutes are to be used, the musical direction is *con sordini,* and when not *senza sordini.*

Sorel, a city and county-seat of Richelieu co., Quebec, Canada; on Lake St. Peter, at the mouth of Richelieu river, and on the Montreal and Sorel railroad; 45 miles N. E. of Montreal. For many years it was the summer residence of the governor-general of Canada. It has large manufacturing and shipbuilding interests. A fort was built on the site of Sorel in 1665. Pop. (1891) 6,669; (1901) 7,057.

Sorel, Agnes, the mistress of the worthless Charles VII. of France; born in the village of Fromenteau, Touraine, France, in 1409. She came to court in 1431 in the

train of the Duchess of Anjou. Her influence was beneficial as long as she lived, but she died suddenly, near Jumigny, Feb. 9, 1450.

Sorex, a genus of insectivorous quadrupeds, including the various species of shrew mice. In this genus — the species of which are to be carefully distinguished from ordinary mice — the upper incisors number six, and the lower incisors four. The upper incisors are very long, and are curved and notched at their bases, and the lower incisors project horizontally. There are no canines, and the molars number eight above and six below. The muzzle is very large and acute, and the feet are provided each with five toes. The limbs are not disproportionate, and the tail is of moderate length.

Sorgho Sugar, sugar obtained from *Sorghum saccharatum*. The unripe canes were found to contain a mixture of cane sugar and fruit sugar; but in the ripe plant Gössmann found only cane sugar, and that to the amount of 9–9.5 per cent.

Sorghum, a genus of *Andropogoneæ*, sometimes made a synonym of *Trachypogon*. Inflorescence in panicles, flowers monœcious, glumes two-flowered, one neuter, the other hermaphrodite, the palea of the latter bearded, that of the former beardless. *S. vulgare* (*Holcus sorghum*, Linnæus) is the Indian or great millet, or guinea corn (see MILLET). It is an annual cane-like cereal, bearing a dense head of spikelets, with small corn-like seeds. In India it forms with rice and wheat the chief staple of the country, but is considered heating. Bread, porridge, etc., are made from it; its seeds when crushed constitute an auxiliary food for cattle, sheep, horses, swine, and poultry. It contains 2½ per cent. of flesh-forming and 11 per cent. of heat-producing matter. The dry stalks and leaves are chopped up for fodder, being called cholum or jowaree. It is cultivated also in Egypt and many other parts of Africa, where it is called dourra. *S. bicolor* is also cultivated in India as a cereal; *S. saccaharatum*, the broom corn or Chinese sugar cane, has been introduced into India for its saccharine juice; the grass is used for fodder, as are the young leaves of *S. halepense*. Some varieties of sorghum are cultivated in the Northern United States and Canada. An inferior quality of molasses is made from the juice. Some have thought the stalk of *S. vulgare* the reed of Matt. xxvii: 48, and its spikelets the hyssop of John xix: 29.

Soria, a city of Spain, in Old Castile, capital of a province of its own name, on the Douro, 113 miles N. E. of Madrid. Adjacent to the town, on the N., are the ruins of the famous city of Numantia, destroyed by the Romans 132 B. C. Pop. (1900) 7,296.

Soricidæ, in zoölogy, shrews; a compact family of *Insectivora*, embracing more than half the species of the order, from the temperate and tropical parts of both hemispheres, except South America and Australia. They have been divided by A. Milne-Edwards into two sections:

A. Terrestrial: Feet without a border of stiff hairs.
(*a*) Teeth white: Anousorex, Diplomesodon, Crocidura.
(*b*) Teeth more or less brown or red: Blarina, Sorex.
B. Amphibious; feet with a border of stiff hairs.
(*a*) Feet not webbed: Neosorex, Crossopus.
(*b*) Feet webbed: Nectogale.

The family appears first in the Miocene.

Sorites, in logic, a series of elliptic syllogisms, *i. e.*, syllogisms in which the conclusion of all but the last is omitted; a series of syllogisms stated in a series of propositions so linked together that the predicate of each one that precedes forms the subject of each one that follows, till a conclusion is formed by bringing together the subject of the first proposition and the predicate of the last. A sorites has as many middle terms as there are intermediate propositions between the first and the last; and consequently it may be drawn out into as many separate and independent syllogisms. There are two forms, the Aristotelian and the Goclenian.

"In the Goclenian sorites extension is made more prominent by starting with the premise which has the two widest terms; in the common form intension predominates, as the narrower terms precede. The former descends in extension from the predicate of the conclusion; the latter ascends in intension from the subject. The Goclenian form suits deduction best; the common, or Aristotelian form, induction. The Glocenian descends from law to fact; the common ascends from fact to law.

GOCLENIAN SORITES.

Sentient beings seek happiness,
All finite beings are sentient,
All men are finite beings,
Caius is a man;
Therefore he seeks happiness.

ARISTOTELIAN SORITES.

Caius is a man,
All men are finite beings,
All finite beings are sentient,
All sentient beings seek happiness;
Therefore Caius seeks happiness."
—Thomson, "Outlines of Laws of Thought."

Sorosis, in botany, a collective fruit, formed of a number of separate flowers, firmly coherent in a fleshy or pulpy mass with the thalamus on which they are situated. The pineapple is an example; each hexagonal division represents a flower, while the crown of leaves above consists of empty bracts. The breadfruit, jackfruit, and mulberry are other examples.

Sorosis, the name of the first women's club in the United States, founded by Mrs.

"Jenny June" Croly and some of her associates, in New York city, in 1868.

Sorrel, the *Rumex acetosa,* a diœcious plant, having the lower leaves sagittate, the upper ones sessile, the outer fruiting sepals reflexed, the inner enlarged, orbicular, quite entire, scarious, tubercled at the base. Found in meadows and pastures. It contains a large quantity of binoxalate of potash. The leaves are used as a salad and a potherb, and in decoction as a febrifuge. Also *Oxalis acetosella.* See Wood Sorrel.

COMMON SORREL.

Sorrel Tree (*Oxydendrum arboreum*), a tree belonging to the natural order *Ericaceæ.* It inhabits the range of the Alleghanies from Virginia to Georgia. The leaves are four or five inches long, oval-acuminate, finely toothed, and strongly acid in taste. The flowers are small, white, and disposed in long one-sided racemes, clustered in an open panicle.

Sorrento (Latin, Surrentum), a city of Italy, on the S. E. side of the Bay of Naples, on the promontory which separates it from the Gulf of Salerno, 7 miles S. W. of Castellamare. It is an archiepiscopal see and possesses a cathedral. The manufacture of silk and the making of parquetry are extensively carried on. It is celebrated for the mildness and general salubrity of its climate, for its beautiful situation in the midst of orange groves and fruit gardens, and for the picturesqueness of the adjacent coast; on these accounts it is much resorted to by summer visitors. In the time of Augustus it was noted for its fine buildings; but few traces of these now exist. Among the Romans the wine of Sorrento was held in high repute. Tasso was a native.

Sortes Vergilianæ ("Vergilian lots"), a favorite mode of divination among the ancients, in which an oracular answer was found in a doubtful juncture by opening Vergil's "Æneid" at random and pricking a pin into the book, or taking the first passage on which the eye chanced to rest. Another method was to take a number of his verses, shake them together in an urn, and draw out one from whose contents to infer good or evil. The ancient Sibylline oracles naturally afforded a precedent, and the strange magical reputation early attached to Vergil helped to make his great poem the book most frequently used for this purpose. The mediæval mind read Christianity into Vergil, and consequently found no difficulty in ascribing equal value to the "Æneid" and the Bible for purposes of divination. We are told that Severus foreread his high destiny in the line, "*Tu regere imperio populos, Romane, memento*"; and Gordianus, who was to reign for but a few days, read his doom in the words, "*Ostendunt terris hunc tantum fata, nec ultra esse sinunt.*" Gundulf, afterward Bishop of Rochester, and two other monks one day at Caen turned over the pages of a book of the Gospels to read their future fortunes, and the Abbot Lanfranc foretold from Gundulf's passage that he should yet become a bishop. Rabelais found his license to escape from the bondage of the convent in the line, "*Heu! fuge crudeles terras, fuge littus avarum,*" and we may see all the weakness of this method in the perplexity of the answers it yielded in the great question of Panurge's marriage. Dr. Welwood tells us that Charles I. and Lord Falkland once made experiment of their future fortunes at the Bodleian in Oxford, and found passages equally ominous to each. The lines which the king read from Dido's imprecation against Æneas plainly foretold rebellion, defeat, and a shameful death; Falkland opened at Evander's lamentation over the untimely death of his son Pallas. Unfortunately for this beautiful story, Aubrey, in his "Remains of Gentilisme and Judaisme," tells it of Prince Charles and the poet Cowley at Paris just before the trial of the king. At any rate Cowley himself tells us that he found some light from Vergil about the Scotch treaty when employed as a secretary in affairs of state; and we read how the Lord Chamberlain used the passage in II Chron. xix: 5–8 during Charles I.'s miserable Sunday of hesitation about the execution of Strafford to convince the king that the responsibility really rested on the judges. Sir Thomas Browne, in his "Vulgar Errors," denounces the "Sortes" as an ancient fragment of pagan divination; and Dr. Nathaniel Home, in his "Dæmonologie" (1650), deplores the loss to the State and the sin to the Church engendered through lots by sieves and books.

The early Christian writers denounced divination by lots as magical, and therefore a form of idolatry. Still the practice continued to be common — "*per sortes sanctorum,*" by the first passage found in the psalter or Gospel, the lectionary or sacramentary. St. Augustine condemned this as an abuse of the divine oracles, yet preferred to see men turn in this way to the Gospels

rather than to demons. And we find that an unsought omen from a psalm ended the opposition to the choice of St. Martin as Bishop of Tours. The "Sortes Apostolorum" was a collection of pious sentences much employed for divination, a bread and water fast of three days being prescribed before using it. A similar use of the Bible long survived among Protestants, and indeed is not to this day extinct among people of simple faith in corners of England and Germany. The obstinate survival of this superstition depends on the naturalness of the notion, where there is a strong conviction of the power and watchful care of an overruling Providence, and a belief in the Bible as the literally inspired hand book of divine guidance to man. Bibliolatry makes the notion of such divination perfectly rational, and we may well believe that its disuse has been merely a consequence of the decaying respect for the mere letter of Scripture.

Sortie, a sally of troops; the issuing of a body of troops from a besieged place to attack the besiegers; an outrush of a beleaguered garrison.

Sosigenes, a philosopher who aided Julius Cæsar in reforming the calendar in the year 46 B. C.

Soter. See DEMETRIUS I.

Sotheby, William, an English poet; born in London in 1757. He is only remembered now as a translator of Homer and Vergil, and a favorite among the "bluestockings" of Byron's time, but he wrote among many other things: "The Battle of the Nile" (1799) and "Saul" (1807), poems, and "Italy and Other Poems" (1828); "The Siege of Cuzco" (1800); "Julian and Agnes" (1801), "Orestes" (1802), "Ivan" (1816), tragedies. He died Dec. 30, 1833.

Sothern, Edward Askew, an English-American comedian; born in Liverpool, England, April 1, 1826. Declining the Church, medicine, or the bar, in 1849 he joined a company of players in Jersey, and soon afterward passed into the stock company of the Theater Royal, Birmingham. From 1852 he appeared in the United States, without much success, till in 1858 "Our American Cousin," by Tom Taylor, was brought out in New York, with Sothern cast for the small part (47 lines) of Lord Dundreary. The piece was a poor thing, and the character of the English peer as playgoers know it was Sothern's own creation, bit by bit. In November, 1861, the play was produced in London at the Haymarket and ran for over 400 nights; and it was again and again revived in later years. Sothern essayed many other characters, but he is remembered chiefly as Dundreary; his other most memorable parts were David Garrick in Robertson's comedy, and perhaps Fitzaltamont in "The Crushed Tragedian"; the latter failed utterly in England, but was always popular in America, whither Sothern returned several times. He died in London, Jan. 21, 1881.

Souari Nut, the fruit of *Caryocar nuciferum*, a native of British Guiana. It is spherical in form, of a reddish-brown color, and measures five to six inches in diameter. It contains four or fewer seeds embedded in a white pulp. They contain a nutty, oily kernel which is pleasant to eat and is imported into Great Britain under the name of BUTTERNUT (*q. v.*).

Soubise (sö-bēz′), **Benjamin de Rohan, Seigneur de,** a famous Huguenot captain; born in Rochelle, France, in 1583. He was the son of René de Rohan, and brother of the famous Henri de Rohan, chief of the Protestant party under Louis XIV. He learned the trade of arms under Maurice of Orange; and when the religious wars again broke out in 1621 he was intrusted with the chief command in Brittany, Anjou, and Poitou. He conducted the war with much spirit, but was eventually obliged to seek refuge in England. In 1625 he made a dashing attack on the royalist fleet in the river Blavet, seized a number of vessels, and captured the islands of Oleron and Ré. He was active at Rochelle during the famous siege in 1627 and 1628, and when the town was captured he retired once more to England. He died in London, England, Oct. 9, 1642.

Soudan. See SUDAN.

Soufflé (sö-flā′), a light and agreeable dish, consisting chiefly of the whites of eggs, to which other ingredients (chocolate, cheese, vanilla, orange-flower water, rose water, various essences, etc.) are added, to give consistency, flavor, and variety. The materials have to be agitated with a whisk till the whole is in a creamy froth, which is then baked in a soufflé pan, made of such a form as to fit into a dish or proper holder that can be sent to table and quickly handed round.

Soul. The Scholastics, following Aristotle, by soul meant the primary principle of life, and held that a plant was endowed with a vegetable soul, that brutes and man had in addition a sensitive soul, while man alone had a rational and immaterial soul. They based their proof of the immateriality of the distinctively human soul on the power of the mind to form abstract ideas.

In Scripture and theology the word soul is used chiefly for "that spiritual, reasonable, and immortal substance in man which is the origin of our thoughts, of our desires, of our reasonings, which distinguishes us from the brute creation, and which bears some resemblance to its Divine Master"

(Cruden). All Christians admit the responsibility of the soul to God for the deeds done in the body; and the orthodox view — that of the Anglican, Roman, and Greek Churches, and of the great dissenting bodies — is that at the final judgment the lot of every soul will be irrevocably fixed, and that it will either eternally enjoy the Beatific Vision in heaven or share the endless torments prepared for the devil and his angels. Two other views — both of which have found supporters in the Church from early ages — are coming increasingly to the front: (1) That of the Restorationists, of whom there are two schools: (*a*) the Dogmatic, who assert, and (*b*) those, represented by Archdeacon Farrar, who express a hope that all men will be finally saved (see RESTORATIONIST: UNIVERSALISTS); and (2) the Annihilationists or Destructionists, who hold that while the righteous will be forever in a state of bliss, the wicked, after receiving the punishment of their sins, will be blotted out of existence. Origen, with Plato, held the doctrine of the preëxistence of souls, which was condemned by a synod at Constantinople in 543 (see TRANSMIGRATION). Two distinct views have at different times found supporters in the Christian Church: (1) That the soul is produced by natural generation (see TRADUCIANISM); (2) that each soul is separately created by God (see CREATIONISM).

Cure of souls, in the Church of England, an ecclesiastical benefice in which parochial duties and the administration of the sacraments are included, primarily vested in the bishop of the diocese, the clergy of each parish acting as his deputies.

Soulé, Pierre (sö-lā′), an American statesman; born in Castillon, France, in September, 1802; was educated at the Jesuits' College at Toulouse. In 1817 he went to Bordeaux to complete his education, but took part in the plot against Louis XVIII., was detected and fled to the mountains of the Béarn country. He was pardoned, however, and returned to Paris in 1824, where he became editor of "Le Nain Jaune" ("The Yellow Dwarf"), a paper noted for its extreme liberal ideas. For the publication of a bitter article attacking the ministers of Charles X. he was sentenced to imprisonment, but escaped and arrived in Baltimore, Md., in 1826. Subsequently he went to New Orleans, where he entered politics and was elected to the State Senate in 1845. In 1847 he was appointed to the United States Senate and elected to a full term in that body in 1849. Later he was sent on a mission to Spain with the object of negotiating for the acquisition of Cuba by the United States; and in 1854 was one of the ministers who framed the famous "Ostend Manifesto." Up to the time of Abraham Lincoln's election he had advocated secession, but thereafter favored coöperation. On the passage by the State of the ordinances of secession, however, he tendered his services to the Confederate government, and in 1862 became an honorary aide on the staff of General Beauregard. At the close of the war he returned to New Orleans and practised law till his death there, March 26, 1870.

Soulié, Melchior Frédéric (söl-yā′), a French novelist and poet; born in Foix (Ariège), Dec. 24, 1800. He commenced his literary career by publishing a volume of poems, "French Loves" (1824), followed by "Romeo and Juliet" (1828). "Christine at Fontainebleau" and "Clothilde" (1832) were popular dramas. Some of his novels also achieved public favor, such as "The Count of Toulouse" (1835); "A Summer at Meudon" (1836). He died in Bièvre, near Paris, Sept. 23, 1847.

Soult, Nicolas Jean de Dieu (sölt), Duke of Dalmatia and Marshal of France; born of humble parentage in Saint Amans la Bastide, Tarn, France, March 29, 1769. In 1785 he entered an infantry regiment as a common soldier. Raised from the ranks, he became successively lieutenant and captain in his regiment. At that time he served on the Upper Rhine and greatly distinguished himself at Kaiserslautern, Weissenburg, Fleurus, and other places, and after successive promotions was named General of Division by Masséna, to whose army he was attached. In the unsuccessful campaign in Italy he was wounded and taken prisoner, but obtained his liberty after the victory of Marengo in 1800. In 1803 he had the command of one of the three camps of the army intended against England, that at St. Omer. He was one of the marshals created immediately after the formation of the empire in 1804; and in the Austrian War, in 1805, distinguished himself at Ulm and Austerlitz. He acquired new fame in the Prussian campaign; and in 1807, after the battle of Friedland, took Königsberg. From 1808–1812 he fought in Spain, but, overmatched by Wellington, was unable to gain many laurels. In 1813 he was recalled in consequence of Napoleon's disasters, to take the command of the 4th Corps of the Grand Army, and commanded the infantry of the guard at Lützen. On the news of Wellington's victory at Vittoria he was sent back to reorganize the French force in Spain, and did his utmost to oppose Wellington's triumphant career till Napoleon's abdication. Soult gave in his adhesion to Louis XVIII., who appointed him commander of the 13th Military Division; and in 1814 made him Minister of War. On Napoleon's return he joined his standard, and held the post of Major-General of the army in the campaign of Waterloo. After the second restoration he took up his

residence at Düsseldorf, but was permitted to return to France in 1819; and in 1827 was raised to the peerage. After the July revolution of 1830, and on two subsequent occasions, he held ministerial office, and in 1846, on retiring from public life, was created Grand-Marshal of France. He died in St. Amans, Nov. 26, 1851.

Soumet, Alexandre (sö-mā′), a French dramatist; born in Castelnaudary, France, Feb. 8, 1788. He won fame with his first elegy, "The Poor Girl" (1814). His principal tragedies are: "Clytemnestra" and "Saul" (1822); "Joan of Arc" (1825); "Elizabeth of France" (1828). He died in Compiègne, March 30, 1845.

Sound, strictly the sensation which results from the stimulating action of atmospheric or other vibrations upon the aural nerves. Beyond ourselves it has no existence, it is purely subjective, and as a sensation must be carefully distinguished from the vibratory motion which is one of the necessary conditions of its existence. Further, the existence of this vibratory motion is itself conditioned by two things — a distributing cause and a suitable medium for transmitting the disturbance to the ear. The study of these in all their possible relations constitutes the science or theory of sound. As far as the physics of the subject is concerned, it is immaterial what the nature of the medium is, provided it is elastic enough to vibrate; physiology, however, demands that the medium be fluid, otherwise the transmission of the vibrations to the organs of hearing would be impossible. Sounds are usually classified under two heads of noises and musical sounds. A musical sound is caused by a regular series of exactly similar disturbances or pulses succeeding each other at precisely equal intervals of time; if these conditions are not fulfilled, the sound is a noise. Where law does not rule phenomena no theory can be established; and accordingly we exclude the consideration of all but musical sounds. The nature of these is best studied by considering such a simple case as the note emitted by a tuning fork. Here, in virtue of the elasticity of the metal, the prongs when displaced from their mean position vibrate about that position according to the simple harmonic law. But the tuning fork vibrates in the air, a viscous fluid, and as the to-and-fro motion of a board in water gives rise to a series of waves isochronous with the reciprocating motion of the board, in exactly the same way does the fork transfer its vibrations to the particles of air in its immediate vicinity. These similarly affect the next set of particles, and so on. The result, therefore, is true wave motion — the propagation, namely, of a certain configuration or grouping among a series of particles. In the case of sound this configuration is a condensation which passes on and is followed by a rarefaction, and the vibrating tuning fork throws off growing spheres of condensation and rarefaction, just as when a stone is dropped into a pool of water the surface is rippled in concentric circles which spread out from the point where the object has disappeared.

As far as our experience goes, motion in space can only be accomplished through time. We should naturally expect, therefore, that sound requires a definite time to pass from one point in space to another; and all experiments agree in fixing the velocity of sound in dry air at about 332 meters, or 1,056 feet per second. This velocity is modified by such causes as the wind, and is affected by the temperature, pressure, and humidity of the air at the time. Assuming Boyle's Law, Newton, in 1687, calculated from theory the velocity of sound, giving for it the expression $\sqrt{\frac{P}{\rho}}$, where p is the pressure and ρ the density of the air at the earth's surface — an expression whose value is 279.95 meters, a sixth smaller than the result given by experiment. This discrepancy was explained by Laplace, who pointed out that there was no account taken of the changes of temperature which occur when air is suddenly compressed and dilated. Thus corrected, theory gives a value differing from the experimental value by less than ⅓ per cent. Sound travels faster in liquids than in gases, and still faster in solids. The experiments at the Lake of Geneva gave 1,435 meters per second for the velocity of sound in water at temperature 8° C. According to Wertheim, the velocities in gold, silver, copper, and iron at 20° C. are respectively 1,740, 2,610, 3,560, and 5,130 meters per second. The same physicist extended his researches to different kinds of wood, establishing that in all cases the velocity is greatest along the fiber. His values for the velocities along the fiber in pine, beech, birch, and aspen, are respectively 3,320, 3,340, 4,420, and 5,080 meters per second.

Passing now to the differences which exist between sounds, we observe that notes may differ in intensity, in pitch, and in quality. Intensity depends on the amplitude of the vibrations; the longer the vibration path of each particle, the more marked is the difference between the condensation and succeeding rarefaction, the louder the note. Pitch depends on the number of vibrations in a stated time, or the number of crests which impinge on any stationary object in that time; the shorter the period of each vibration, the greater is the number of vibrations per second, the higher the pitch. Both of these note characteristics are limited as far as hearing is concerned. A sound may be too weak to be heard; a too

Sound

intense sound would probably result in the destruction of some part of our organs of hearing. Similarly there are limits of audibility as regards pitch — limits which differ for different persons. The vibration numbers of audible notes, however, may be stated as lying between 20 and 38,000. Notes of very high pitch are very painful to the listener, but a note which is excruciating to one may be quite inaudible to another. The third characteristic, quality or character, corresponding to the French *timbre* and the German *klangfarbe*, "tone-color," depends on the configuration or external structure of the individual waves. According to Fourier's theorem, any periodic function can be expressed in terms of a series of simple harmonic functions, whose periods are 0, 1, ½, ⅓, ¼, ⅕, etc., times the period of complete function. Now, all musical notes are periodic functions, and, as indicated above, the note given by a tuning fork is very approximately simple harmonic, and is therefore called a simple tone. Not so, however, with the really useful notes in music, such as those given by an organ, a trumpet, a violin, or the human voice. Such notes are compound tones, and may be represented as the superposition of a series of simple tones whose periods are related as Fourier's theorem requires. Thus in a violin note of 100 vibrations per second, not only is there the simple harmonic of 100 vibrations which gives the note its pitch, but there are also the simple tones of 200, 300, 400, etc., vibrations, all combining to give a sustained and apparently single sound. These overtones or upper partial tones, as they are frequently called, have no effect on the pitch, but they decide the quality.

As long as two notes which are sounded together are the lower members of the same harmonic scale, they blend together and form what is called a chord. Thus the notes of frequencies 300 and 400 sound agreeably together, being separated from one another by the musical interval known as the fourth. When, however, the notes of frequencies 800 and 900 are sounded together, a new phenomenon comes in, which falls next to be considered. Suppose two notes of 100 and 101 vibrations per second respectively to be sounding together. Then the resultant sound wave will be represented by the superposition of the representative wave forms of these notes. Once every second the crests are coincident; but between the seconds the one crest is gaining upon the other, till at the end of the second it has gained one whole vibration and is again coincident. Half-way, therefore, the crest of the one will fill up the trough of the other; and this will have the necessary effect of diminishing the resultant vibration at that instant. Consequently the intensity of the sound will then be at a minimum, half a second later at a maximum; and this alteration in intensity will continue as long as the notes are sounded together. To the ear there will seem to be a rise and fall in the intensity occurring every second — in other words, the notes are said to beat once in a second. Similarly the notes of frequencies 100 and 102 beat twice in a second; and, in general, the number of beats given by two beating notes is the difference of their vibration numbers.

When the notes are very nearly in tune, the beating is slow; and the greater the interval between the notes, the faster the beating, so that if the notes are too distant no distinct beating is heard. The mind, indeed, cannot follow these beats when they occur over 30 times a second; their presence is still evident, however, by the roughness which accompanies the sustained sound. For the ordinary musical scale, notes within a tone of each other have this accompanying roughness, which for semitones becomes very disagreeable, and hence the discordant nature of the chord formed by two successive notes of a diatonic scale. Helmholtz points out that this disagreeable sensation is similar in character to that produced on the retina by a fluttering light. Beating, however, may take place between notes so far apart that it cannot be due to the cause simply as stated above; and the explanation of this, which is not the least of the services rendered by Helmholtz to our knowledge of the physical basis of music, brings us to the consideration of the interference of sounds.

It has been implicitly assumed that in dealing with two sets of vibrations we may simply superpose them to get the resultant vibration. Mathematical analysis shows, however, that when two notes of given frequencies are sounded together, additional notes arise whose frequencies are the doubles and the sum and difference of those of the primaries. Hence if we take two notes a fifth apart, say with vibration numbers 400 and 600, the difference tone (200) and the combinational tone (1,000) are introduced. The latter cannot always be distinguished, but the former is easily heard as being an octave lower than the lower note of the chord. This low combinational tone was discovered by Tartini (born 1692, died 1770), after whom it is known as "Tartini's beat." Suppose now that the fifth is slightly out of tune, say 400 and 601 instead of 400 and 600. The first combinational tone has 201 vibrations. In conjunction with the lower primary, this first combinational tone produces a second combinational tone of frequency 199, and these two combinational tones evidently beat, giving two beats per second. This beating of the

Sound

combinational tones is readily heard on the harmonium and organ, whose notes are not tuned in perfect intervals but on the equal temperament system.

The material systems which by their vibrations affect the atmosphere so as to give rise to these sound waves must themselves vibrate in as complex a manner. Indeed, only the simpler cases have as yet been brought within the range of analysis; and the most instructive of these is, perhaps, the stretched uniform cord, such as we have in the piano, harp, violin, etc. If a pulse or wave be sent along such a string, it must be reflected, so to speak, when it comes to the fixed end, and propagated in the reverse direction; and this is what is continually occurring when a stretched cord is vibrating, either as a whole or in two, three, four, or more segments. Two series of equal pulses are propagated along the string in opposite directions, and as a necessary consequence certain definite points on the string, mutually equi-distant from each other and from the extremities, become stationary, their resultant amplitude being always zero. These points, the number of which depends on the relation which the velocity of the propagated wave has to the length of the string, are called the nodes, Including the extremities, the number of nodes is one greater than the number of segments in which the string vibrates. If the string vibrates in two segments, the vibrations are twice as fast as those of the same string vibrating as a whole; or, if the fundamental note of the string has 100 vibrations per second, the vibration number of the note of the doubly-segmented string is 200, that of the trebly-segmented 300, and so on. Thus it is possible to produce from the same string a series of notes harmonically related; not only so, but the string may be made to vibrate in several of these different ways at once, thus giving rise to a compound tone. The longer the string, the deeper the note, and the greater the number of harmonics which are practically possible. On a pianoforte wire these harmonics are easily recognized, and if the dampers are raised the other wires whose notes correspond to these harmonics are also set in vibration.

It is on this sympathy between two systems which vibrate in the same time that the phenomena of resonance depend. Every cavity has one or more tones of a certain definite pitch to which it resounds; that is to say, certain tones which, if sounded near or in front of it, will be reinforced in intensity. It is to effect this reinforcement that tuning forks are mounted on resonance boxes. Any particular vowel sound also owes its distinctive quality to the resonance of the mouth cavity which is necessary for its production. The sound in passing through the mouth has such of its harmonics reinforced which correspond or approximate in pitch to the proper tones of the cavity. Such is the theory of Helmholtz, established on experiments of Willis and Donders, supplemented by his own — a theory which has been corroborated and extended by the recent researches of Professors Jenkin and Ewing into the nature of vowel sounds by analysis of the impressions on the tin foil of a phonograph, which were magnified and transferred to paper by an ingenious mechanical device.

The vibration of bars, plates, and membranes offers increasing difficulties to the mathematician, but experimentally many interesting facts have been established which serve as landmarks to the analyst. Chladni's figures, produced by bowing a metal plate, two points of which are fixed, and over which minute particles of sand or other powder have been sprinkled, are familiar to many. The plate is set vibrating in segments, and along the nodal lines the particles settle, being tossed from the intermediate portions by the force of the vibrations. The theory of the vibration of membranes has acquired a greater interest since the invention of the phonograph. Sedley Taylor has taken advantage of the laws of interference of light in his phoneidoscope, in which the nodal lines of vibrating soap film are shown by the contours of colored bands, which are viewed by reflected light.

The reflection and refraction of sound in air have many important practical bearings, some of which are considered under Acoustics and Echo (*q. v.*) In a homogeneous atmosphere sound travels in straight lines; but in certain circumstances heterogeneity of the air may occasion considerable deviation of a sonorous ray from its rectilinear course. According to Prof. Osborne Reynolds, the diminution of temperature of the air as we ascend must produce on the sound rays an effect analogous to the optical phenomenon of the mirage. In other words, the rays are bent upward, so that the sound may be quite inaudible at a place not very distant from the source of sound. On a bright sunny day the vertical variation of temperature is much more rapid than on a dull or rainy day — consequently the bending of the once horizontal ray is greater, and audibility at a distance diminished. This is the explanation which Reynolds offers of the interesting experiments of Tyndall on fog signals, which were worst heard on clear warm days. It is probably the true theory, though Tyndall's own explanation that the sounds were stopped, reflected, and broken up by the flocculent condition of the atmosphere arising from unequal heating or moisture, may also hold in certain cases, and undoubtedly gives a reason for the continued and diminishing echo which followed the blast of a siren when the sea was of glassy smoothness and the air apparently

clear. The first really scientific treatises on the subject were the works of CHLADNI (*q. v.*), who collected all that was known up to his time and added much that was new. Savart, Mersenne, Laplace, Lissajoux, Duhamel, Trevelyan, Seebeck, Cagniard de la Tour, and others, made important additions both to the theory and methods of experiment, but not till the appearance of Herschel's article in the "Encyclopædia Metropolitana" was there any systematic treatment of the subject. Airy's small treatise (1869) is a valuable compendium of the mathematics of vibrations. Helmholtz's "Tonempfindungen," threw a flood of light on many doubtful points, combining with rare skill the scattered work of his predecessors, and establishing harmony upon a real scientific basis. Sedley Taylor's "Sound and Music" (1871) is a popular exposition of many of these discoveries. Mayer's "Sound" (1878) is an elementary introduction to the science. The standard treatise on the subject is Lord Rayleigh's "Theory of Sound" (3 vols. 1877–1879), which besides developing the theory systematically by the aid of the most powerful methods of modern analysis contains descriptions and gives the results of the scattered experiments of many generations.

Sound, the strait which leads from the Cattegat into the Baltic Sea, having Sweden on the E. and the Danish island of Zealand on the W. It forms the usual passage from the North Sea to the Baltic, is 50 miles long and nearly 3 miles wide at its narrowest part, between the towns of Helsingborg and Elsinore. Its passage, defended by the strong Danish castle and fortress of Kronborg, was forced by Nelson in 1801 (see COPENHAGEN). From the 15th century all ships using this channel, except such as belonged to certain of the Hanseatic towns and one or two others in the Baltic, were charged toll for passing through. These sound duties were abolished March 14, 1857, by a treaty between Denmark and the principal maritime powers. A pecuniary compensation of $16.931,300, of which Great Britain paid $5,626,030, was given to Denmark, which bound itself to maintain the lighthouses and superintend the pilotage of the Sound.

Sounding, the operation of trying the depth of water and the quality of the bottom, especially by means of a plummet sunk from a ship. In navigation two plummets are used, one called the hand lead, weighing about eight or nine pounds; and the other, the deep sea lead, weighing from 25 to 30 pounds (see LEAD). The former is used in shallow waters, and the latter at a distance from shore. The nature of the bottom is commonly ascertained by using a piece of tallow stuck upon the base of the deep-sea lead, and thus bringing up sand, shells, ooze, etc., which adhere to it. The scientific investigation of the ocean and its bottom has rendered more perfect sounding apparatus necessary, and has led to the invention of various contrivances for this purpose, among the most simple and common of which is Brooke's sounding apparatus. Some of the deepest sea soundings yet obtained that can be relied on have been obtained by the British vessel "Challenger." See CHALLENGER EXPEDITION: DEEP-SEA SOUNDING.

Sounding Board, in a pianoforte, a piece of wood, usually the best Swiss fir, placed behind the strings in order that the resonance may be increased. Its edges are attached to the framing, leaving the central part to vibrate freely under the strings when they are struck. The term is also applied to a wood screen placed behind a speaker in halls and churches for acoustic purposes.

Soup. As a general rule soup is made by boiling meat or vegetables in what is called "stock." To prepare the latter the cook obtains fresh meat, bones, and vegetables such as carrots or leeks, and after the addition of salt allows them to simmer for some hours in sufficient water. The stock is the infusion thus prepared, and contains small quantities of starch, if vegetables have been used, and in any case some gelatine, which will often cause it to solidify on cooling. Together with a small quantity of nourishment, the infusion has extracted from the meat and vegetables those pleasant flavored extractives which give it taste. Taking this stock as a basis, the various soups are made by boiling with it the bones and flesh of the hare, ox tails, etc., and vegetables such as carrots, potatoes, turnips, rice, sago, etc.

If we view the preparation of soups from the point of domestic economy, the following facts must be kept in mind: Bones, otherwise valueless to the householder, contain much nutritive gelatine, which is extracted from them in the preparation of stock; no bones should therefore be thrown away, for their use is a clear gain. It is to be remembered that meat on the other hand yields little of its nutritive matter to the stock, and if the meat be thrown away, as it often is, the greater part of its value is lost. It is the greatest waste of nutritive material to prepare a stock from gravy beef, which yields hardly more to the water than its flavoring extractives; yet householders regularly buy meat for this wasteful purpose. If then it is an object to obtain the nutritive value from the food, the meat should as much as possible be retained and eaten. While the greatest extravagances may be thus committed by using meat, which might be eaten as such, in the preparation of stocks and clear soups, it is

clearly the case that equal wastefulness is frequently committed by throwing away the water in which meat, fowls, fish, bacon, and pork have been boiled. These always contain some nutritive matter, and every capable cook should be able to make it the basis of an excellent soup.

From a dietetic point of view we may regard soups as gastric stimulants and as articles of nutrition. They owe their stimulating properties to their warmth, and the salt and flavored extracts they contain, and are of value inasmuch as they cause a ready flow of digestive juice preparatory to the more substantial portions of the repast. To some persons this stimulating action is necessary preliminary to a properly digested meal, and it is often obtained by more harmful resorts, say by a cocktail. Most persons after a hard day's work, and with the bodily energies below par, have experienced the difficulty of at once facing a plate of cold mutton or beef, which would, however, have been quite acceptable if it had been introduced by a basin of hot broth.

From the point of view of nourishment little can be said of clear soups and beef tea, and numberless invalids are yearly starved out of existence by doctors and nurses who imagine that by stewing a pound of gravy beef the nourishment goes to the water. Soups thickened by vegetables, such as peas, potatoes, etc., are highly nutritious, and pieces of meat and thick gravy retained in the soup add greatly to its nutritive value.

Sourabaya, a seaport of Java, capital of a province of the same name, on the Strait of Madura. It possesses a large and secure harbor; a building yard, graving dock, and an extensive trade in exports of native produce, and imports of European manufactures. Pop. about 145,000.

Sourakarta, or **Solo,** a town of Java, capital of the province of the same name, 140 miles W. S. W. of Sourabaya. It has manufactures of cotton and other tissues, leather, etc. Pop. about 100,000.

Soursop, a West Indian fruit tree, genus ANONA (*q. v.*). The tree does not attain a large size, but is much branched and very ornamental. The fruit is very large, often weighing two or three pounds; its pulp is white, succulent, sweet, with an agreeable acidity. The soursop is a pleasant and refreshing fruit, and is very much used in the West Indies, being produced in great abundance.

Sousa, John Philip, an American musician; born in Washington, D. C., Nov. 6, 1854; studied music, and was leader of a band when only 17. He was band leader of the United States Marine Corps, 1880–1892, and in the latter year organized the famous Sousa Band, which gave concerts in England, France, Germany, and all over the United States. He composed numerous songs, waltzes, operas, and orchestral suites, but was best known from his marches, which were republished throughout Europe.

Soustenu, or **Soutenu,** in heraldry, a term applied when a chief is, as it were, supported by a small part of the escutcheon beneath it, of a different color or metal from the chief, and reaching, as the chief does, from side to side, being so to speak, a small part of the chief of another color, and supporting the real chief.

Soutane, the ordinary outer garment worn by Roman Catholic ecclesiastics in ordinary life, and always under the vestments in public ministrations. It is generally of coarse cloth or serge; for priests the color is black, for bishops and monsignori purple, for cardinals red, and for the Pope white.

South, The, or **Southern States.** At the beginning of the Civil War the South was the richest and most progressive section of the United States, though containing only one-fourth of the white population. According to the census of 1860 the assessed value of all the property of the United States was $12,000,000,000, of which the South owned 44 per cent. In the same year the value of the crops produced by the South had more than-half of the value of the total agricultural products of the country. In 1860 30 per cent. of the entire banking capital of the United States was in the South, and the assessed value of property in Georgia was greater than the combined wealth of Maine, New Hampshire, Vermont and Rhode Island. South Carolina was $68,000,000 richer than Rhode Island and New Jersey, and Mississippi outranked Connecticut by $160,000,000. The Civil War, it is estimated, destroyed property in the South to the value of $2,100,000,000, and the reconstruction period caused a further loss of $300,000,000. To this may be added the cost of the war, the hundreds of thousands of active men killed or permanently injured, and the South's share of the national indebtedness, making an aggregate loss of $5,000,000,000, a sum eight times greater than the combined capital of all the National banks in the United States and nearly as large as the aggregate capital invested in manufactures in the whole country. To show some of the results of the Civil War in the finances of the South it is only necessary to cite the figures for the decade 1860–1870. In 1860 the assessed value of property in Massachusetts was $777,150,000, compared with $5,200,000,000 in the entire South. In 1870 Massachusetts had $1,590,000,000, and the South only $3,000,000,000. Such was the poverty of the South that the one State of Massachusetts listed for taxes more than

one-half as much property as all the States of that section could show.

From this condition of poverty and depression, which lasted many years after the close of the war, the South has steadily though slowly been recuperating, and has again taken her place in the foremost rank. Her agricultural and industrial progress has been remarkable. From 1880 to 1890 there was an increase in the value of its personal property of $3,800,000,000, against $3,900,000,000 in the New England and Middle States combined. The average value per acre of all farm products in the South was $7.18; the average value for all the States except the South was $6.87. The grain production of the South in 1895 was valued at $261,972,823. In 1898 the annual value of the South's agricultural products was estimated at $930,000,000. In 1880 the South had $257,244,561 invested in manufacturing enterprises; in 1890 its manufactories represented an investment of $659,008,817. The value of its manufactured products rose from $457,454,777 in 1880 to $917,589,045 in 1890. This was a wonderful advance in 10 years and proportionately far greater than that of any other part of the country. In the manufacture of cotton goods it is rivaling New England, while in the production of coal and pig iron it surpasses all the other States. Between 1880 and 1898 more than 28,000 miles of new railroad were built in the Southern States

As to what section of our country will ultimately be the cotton manufacturing section there is some difference of opinion among Northern writers. The people of the South can see but one result and that is the mills will eventually "follow the flag" to where the cotton is grown. The following taken from a recent Boston paper says:

"The South will soon lead the world in cotton manufacture. That the scepter is gradually being wrested from us is easy to figure, and at the present rate of progress eight years will suffice to swing the balances South. The Isthmian canal will benefit the South more than the North. There is no escaping the economic law that where a product can be manufactured lowest there it is bound to be manufactured. The cotton factory that is nearest the cotton field will win in the long run."

The leading cotton manufacturing States of the South are North Carolina, South Carolina and Georgia. The following table gives the number of spindles in them for 1890 and 1900:

	Spindles.	
	1890.	1900.
North Carolina	337,786	1,133,432
South Carolina	332,784	1,431,349
Georgia	445,452	815,545
Totals	1,116,022	3,380,326

It will be seen that the increase in the above three States was more than 300 per cent. during that period. When you get it down to its last analysis the claim that the South must and will eventually be the great cotton manufacturing section of our country seems to be reasonable, owing to the following advantages which it enjoys over other sections: The natural advantages are entirely with the South. Most of the artificial advantages are with New England. Which set of forces is the most powerful? It is an economic truism that natural advantages persist and are progressive forces, while artificial advantages diminish and finally disappear. The South produces cotton, coal, timber and iron and it is close to the consumer.

As population grows denser the fundamental advantages of the South, which never can be lessened, will exert continually increasing force. Cheap raw material, cheap labor and nearby markets are economic magnets far more powerful than opposing forces, and they are certain to attract to their support the forces now enjoyed by the New England States. There is no sentiment in money. It goes where it has the best profit in sight, and as fast as the investors of the North become acquainted with the advantages of the South in the manufacture of cotton, then gradually the cotton mills of New England will go South.

The advance which the South is now making in industrial progress receives further testimony in the report of President Spencer of the Southern railway, regarding the operations of that line for the year 1901–1902. He gives many statistics of the location of new industries along the lines of that system, which throw a strong light on the new spirit of enterprise which has been awakened in the Southern section of our land. During the year under discussion no less than 566 industrial plants were either completed or in process of construction along the mileage of the road, which means the establishment of more than one and a half a day including Sundays. This is an extraordinary record and shows decisively that the spirit of Southern enterprise is full of energy and life. The most significant part of the report is the statement that the Southern people are endeavoring in earnest to turn to account the possibilities furnished them by their own productions. The cotton of the country is grown in the South but its manufacture has hitherto been almost exclusively confined to the Northern section of the land. New England has been the great center of the textile industry but now a change is to be made. The South is determined to manufacture its own cotton, to a great extent, at least, and the day is apparently not far distant when the music of the looms will be heard all over that section of our

country. Hitherto the South has been content to accept as her share of the profits of the cotton trade the price of the raw material as it comes from her plantations; now she proposes to secure some of the profit which comes from transforming it into manufactured goods.

Why she has not done this before has been a mystery of trade. The textile industry can be much more profitably managed in the South than in the North, for every natural advantage is found there in its favor. The cost of transportation of the cotton is saved; water streams to furnish the motive power for the factories are plentiful; and, more important than all else, the cost of labor is smaller than it is in New England.

Along the lines of the Southern in 1901, 42 new textile plants were established and 37 additions were made to old plants, the capital invested being $6,670,350.

South African Union, a federation of the four former British colonies, Cape of Good Hope (Cape Colony), Natal, the Transvaal, and the Orange River Colony, proclaimed May 31, 1910. The former colonies became provinces and retained their former names, excepting the Orange River Colony, which became the Orange Free State. Viscount Gladstone was appointed the first governor-general, and Louis Botha, the former Boer general, the first premier. Cape Town (Cape Colony) was selected for the seat of the Legislature, and Pretoria (Transvaal) for the seat of the executive government. The Legislature or Parliament comprises a Senate of eight members, elected by each provincial legislature and eight nominated by the governor-general, and a House of Assembly of 51 members from Cape Colony, 17 from Natal, 36 from the Transvaal, and 17 from the Orange Free State. The official languages are the English and Dutch. For details concerning the provinces, see their respective titles.

South African War. In the year 1899 Great Britain entered upon a war which she intended to be a little one, but which became a great war — one of the most remarkable conflicts in history, and in some respects unique. On the propriety of the war public opinion the world over appeared bitterly divided; even in England there existed an honest opinion against the war, while in this country a similar and yet more widely spread feeling made itself manifest on more than one occasion. There were those, principally among the liberals of Europe, who believed the struggle marked the decadence of Great Britain, and that she had abandoned those standards of public honor and good faith which her people believe have enabled her to reach preeminence among the nations. In any event, unprejudiced observers of the trend of events in South Africa in the few years preceding the war saw that an "irrepressible conflict" was brewing; that the crisis of the racial differences which sprang into expression when the Afrikander Bund was organized in 1881 could not be long delayed.

The Jameson raid of 1895–1896, preceding the outbreak of war by three years, is looked upon by many as evidence of the disposition of the British government to break faith with the Boers. On the other hand, it has been pointed out with apparent justice that this rash act of Dr. Jameson and his companions, for which Cecil Rhodes seemed to have been primarily responsible, in that he encouraged the agitators, bound the hands of the British government; in fact, prevented the preparations for war which Great Britain signally failed to make and enabled the government of Mr. Kruger to increase its resources for warfare to such an extent as to make them practically inexhaustible. Whichever view be taken, and there is in all probability some truth in each, Dr. Jameson and his followers, many of them British army officers and servants of the Chartered South Africa Company, were captured by General Cronje in actual Boer territory and after some delay were turned over to the British authorities for trial on charges of invasion of friendly territory.

The famous impulsive telegram from Emperor William to Mr. Kruger, which led to the calling out of a British flying squadron and a subsequent mollifying explanation by the emperor, had undoubtedly a great deal to do with giving the Boers the idea that Germany was willing to sustain them in a possible struggle with their suzerain power, while the diplomatists of Europe were not slow to fan the feeling that under certain circumstances Europe might be depended upon to intervene. That the Jameson episode had caused a great increase in the anti-British feeling on the Continent as well as shocking conservative American and English public feeling was evidenced by the strenuous efforts of the British government to offset it by declarations of responsible officials. For instance, on May 8 in the House of Commons, Mr. Joseph Chamberlain said of the Jameson raid: "To go to war with President Kruger to enforce upon him reforms to the internal affairs of his State in which secretaries of State standing in their places have repudiated all right of interference — that would be a course of action which would be immoral." Despite these assurances, however, the Boer leaders continued to prepare for war. They had spent enormous sums — some $12,000,000 in five years — for guns and ammunition (a return by Mr. Schreiner to Sir Alfred Milner shows that from July 3 to Aug. 23, 1889, the Orange Free State imported 1,131 guns, 1,293,100 cartridges, 1,954 pounds of

South African War

powder, 4,800 pounds of lead and other munitions) raising the money by taxes of a monopolistic character, while the restlessness of the Outlanders grew and grew and the tension between the Transvaal republic and its suzerain increased. It may be stated here that in 1897 the Transvaal had become the richest gold field in the world, the production of gold having been in that year 2,511,544 ounces, while the capitalization of the Rand mines owned chiefly in Great Britain had reached the enormous total of $3,000,000,000. The revenues of the State had increased from $900,000 a year to $22,000,000. The salary of Mr. Kruger at this time was $40,000 annually.

It was under these circumstances that the world's eyes instinctively became more fixed on South Africa. Great events were evidently impending. The grievances of the Outlanders became more and more aggravated. They were set forth originally as: Lack of municipal improvements in Johannesburg, of independent courts, of free schools in which English might be taught, and a demand for the suffrage after a reasonable period of residence. The Outlanders said they paid nine-tenths of the taxes but had no rights of freedmen. Forts had been built to command Johannesburg, they complained; 38,000 Outlanders had signed "a petition of rights" in 1892 and had been spurned by the Volksraad. In 1897 a petition signed by 21,600 British subjects was sent to Queen Victoria asking for reform. Responsible journals in London took up these grievances, and it is much to be feared that journals not so responsible were induced to fight the fight of the Outlanders. The British government was at last forced officially to investigate conditions.

Sir Alfred Milner was appointed high commissioner in 1897. Joseph Chamberlain, the most aggressive of State secretaries, approached the Boer government, and his negotiations resulted in the request by the Boers that all differences be referred to arbitration. On Oct. 18, 1898, Mr. Chamberlain rejected this proposition, and the question of suzerainty suddenly came to the front. This had been tacitly ignored in the London convention of 1884, under which, according to a much quoted dispatch of Mr. Chamberlain, the Transvaal had become in fact "a foreign State." Indeed, Lord Derby, who negotiated the London convention, thus himself described the powers retained by Great Britain: "By the omission of those articles of the convention of Pretoria which assigned to her majesty and to the British resident certain specific powers and functions connected with the internal government and the foreign relations of the Transvaal State, your government will be left free to govern the country without interference, and to conduct its diplomatic intercourse and shape its foreign policy, subject only to the requirement that any treaty with any foreign State shall not have effect without the approval of the queen." Gold, however, had not been discovered in the Transvaal when the London convention was signed; not, in fact, till 1886, two years after, awakening the greed of the Boer citizen and the British adventurer to obtain some of the riches of the Rand. With the discovery of gold came the Outlander and the struggle to use him — on the one hand for the purpose of enriching the oligarchy, on the other hand to resist excessive taxes and, it is only too much to be feared, to gain a political foothold in the country. The action of the British government then in asserting in opposition to Mr. Kruger's contention that the convention of London was not a treaty between the two independent States, but was merely an agreement whereby a suzerain granted certain rights of self-government, gave the enemies of Great Britain a foundation upon which to reiterate the charges of bad faith made after the Jameson raid. That Mr. Chamberlain honestly considered that intervention to protect British subjects was necessary is evident. The murder of a miner named Edgar while resisting the entry into his home of a Boer policeman, appealed strongly to British sympathies. Outlander meetings were organized, a council was formed and even Sir Alfred Milner in reviewing the situation declared "the cause for intervention to be overwhelming." The summer of 1899 was occupied by negotiations, a conference having been arranged on May 30 between Sir Alfred and President Kruger at Bloemfontein, the capital of the Orange Free State.

Mr. Kruger was empowered by the Volksraad to offer a reduction in the time of residence necessary to become enfranchised from 14 years to 9, but he maintained that the independence of the Transvaal must be recognized and the question of suzerainty laid aside forever. On this last point there could, from the British view be no agreement. The negotiations were broken off. On Sept. 22 Mr. Chamberlain sent this message: "The refusal of the South African Republic to entertain the offer thus made, coming as it does at the end of nearly four months of protracted negotiations, themselves the climax of an agitation extending over more than four years, it is useless to pursue a discussion on the lines hitherto followed, and her majesty's government is now compelled to consider the situation afresh and formulate proposals for a final settlement of the issues which have been created in South Africa by the policy constantly followed for many years by the government of the South African Republic (the Transvaal). They will communicate the result of their deliberations in a later dispatch."

It has been said that the Boers did not expect such a reply; that they were deceived by Mr. Greene, the British agent at Pretoria, and by Sir Alfred Milner, but to the student of British history it is impossible not to see that Great Britain was acting in accordance with her usage in such matters. She would be the last to give up suzerainty or territory without a contest.

Matters now had reached a pass when the British government began to order troops from India to South Africa as a precautionary measure. Events did not delay; there was a distinctly uneasy feeling in Great Britain which became acute indignation when President Kruger sent his famous ultimatum of Oct. 9, 1899. In this he demanded arbitration for the differences between the South African Republic and Great Britain and "that all troops in South Africa since June 1, 1889, shall be instantly withdrawn; that all reinforcements of troops which have arrived in South Africa since June 1, 1899, shall be removed from South Africa within a reasonable time; that her majesty's troops now on the high seas shall not be landed in any part of South Africa" and an answer was required by 5 P. M. Oct. 11. It was added that in the event of an unsatisfactory reply the Boer government "would be compelled to regard the action of her majesty's government as a formal declaration of war." The British government replied by 10:45 P. M. the following day. It expressed regret at the peremptory demands of the republic and said it was impossible to discuss them.

Thus the war began.

During the latter part of the negotiations the Boer government had been sending its commandos to the Natal border. General Joubert was in chief command. In the meantime the British government had ordered 10,000 troops from India to Durban and Cape Town — the whole South African establishment before the advent of these troops was less than 12,000. The famous Gordon Highlanders were among the first troops landed at Durban. All those were sent to Ladysmith, where Sir George White, who had been quartermaster general and previously commander-in-chief in India, had gone on being sent out to take command in South Africa. On Oct. 11 came the formal declaration of war by the Boer republic, which had been preceded by the announcement — a foregone conclusion — that the Orange Free State had decided to stake its future with the Transvaal. Then began the series of reverses to British arms which immensely heightened the prestige of the Boers, and made necessary the greatest army that England had ever put into the field. The first reverse was trivial; it was the capture at Kraai Pan by the Boers of an armored train with 15 men and two guns. The first battle was that of Dundee or Glencoe, fought Oct. 20, 1899, in which, while the Boers were repulsed, they succeeded in gaining a strategic position which ultimately forced the evacuation of Dundee, the center of the coal fields of Natal, by the British, and the hasty retreat of General Yule to Ladysmith. At first there was great elation over the battle of Glencoe in England, but this was speedily changed when it became known that General Symons had been mortally wounded, that a squadron of cavalry had been captured, and that the British had had to retreat, leaving the dying general and wounded soldiers in the hands of the Boers who subsequently occupied Dundee. Military critics have long since pointed out the lack of ability that prompted Sir George White to hold an isolated post like Dundee, but he defended himself by alleging the political pressure brought to bear by the Natal authorities. The only answer, of course, to that is that a military commander in time of war is the sole responsible judge of his own actions. Dundee was a bad mistake and it was followed by others worse still. Perhaps out of the whole muddle of affairs at this stage of the war no feat of arms stands out brighter than General French's engagement at Elandslaagte, undertaken as a diversion to enable General Yule and his wornout troops to reach Ladysmith. This was the first time French's name had been mentioned and it gave promise well borne out of a brilliant future for the enterprising cavalry commander, who had been a sailor before he entered the army. It was a distinct defeat for the Boers and was remarkable also as being the occasion of the "pig-sticking" letters which troopers of the lancers sent home telling how they had slaughtered the Boers, and which formed the text of fierce denunciations of British soldiery. However, it was only a temporary check. Another engagement at Rietfontein followed before Yule got safely to Ladysmith which he entered on Oct. 26, having been since the 22d on the march from Dundee. Soon the British had to swallow, with many a grimace, a bitterer pill of humiliation. Sir George White was being hemmed in at Ladysmith, slowly but surely. On the 30th he made a reconnoissance in force which proved a failure. At Nicholson's Nek he was forced to retire with a loss of 319 officers and men killed and wounded and two battalions of infantry and a mountain battery captured. Altogether nearly 970 prisoners were taken by the Boers, who had simply surrounded the men of the Gloucestershire regiment and Royal Irish Fusiliers on a kopje and waited till they surrendered. This was the first revolt of the army mule; the stampede of the animals bearing mountain guns during

South African War

the night march having thrown Colonel Carleton's column into confusion. The army mule was heard of later on similar occasions.

It was a disastrous day to Sir George White; he almost failed to make good his retirement into Ladysmith; he was enabled to do so, in all probability, only by the arrival of the naval brigade under Captain Lambton, whose long naval guns silenced those of the Boers and made the retirement effective. Next day Ladysmith was beleaguered by the Boers, Sir George White being shut up there with 12,000 men, the pick of the Natal field force. In the last train from Ladysmith, before the Boers cut the railroad, was General French, who had been recalled South under orders to a command of the cavalry brigade then on the way to Cape Colony. With the siege of Ladysmith may be said to close the first chapter of the war, a period full of humiliation to the British, of elation to the Boers. It has been said that had the invaders shown any military ability whatever they could have marched to the sea and captured Durban. The flower of the British troops in South Africa was locked up, reinforcements were slow in arriving and the possession of a seaport would have given President Kruger certain rights under international law that would have proved very embarrassing to Great Britain. However, the Boers were content to sit down at Ladysmith, hoping to force a surrender and tempted by the desire to secure the immense stores of munitions of war deposited at the place as the military headquarters and depot for the colony of Natal Up to the time the siege of Ladysmith began, a short period of 11 days, the British had lost nearly 1,500 men, the approximate list being 208 killed, 703 wounded, 565 captured. It is probable that the Boer losses were not more than 150 killed, 200 wounded and 400 prisoners. General White reported having captured 300 Boers at Elandslaagte and State Secretary Reitz of the Transvaal admitted having lost 40 killed in that engagement. The loss of military prestige to Great Britain, however, far exceeded her loss in men and guns.

To say that the initial results of the Boer war had thrown gloom over Great Britain is to put it mildly. There was a feeling akin to consternation, mingled with deep resentment at the continental nations whose press and public joined in a chorus of opprobrium, led by the journalists of Paris and Berlin. But while the nation smarted it did not flinch. An army corps of 50,000 men was already under orders for South Africa, and Gen. Sir Redvers Buller was gazetted as the commander-in-chief. In the light of recent events there is something pathetic in the manner in which he was hailed as the man of the hour. "It is an ideal appointment," said one British journal of weight when the announcement was made. Innumerable stories were told of his personal prowess and his indomitable will. "A man of iron," seemed to be the popular impression of the hero. A cursory glance at Buller might lead one to the same judgment, but the closer verdict of a well-known artist of New York city to whom a photograph of the general was shown, was strikingly justified later on. "He is a stubborn man," said the artist, "but it is a distinctly weak face, nevertheless. He lacks initiative and enterprise and can be led by others. I do not think he will be a success." With Buller, as lieutenant-general of divisions, were sent Lord Methuen, Sir C. F. Clery and Sir W. F. Gatacre. Of these Methuen's appointment seemed a distinctly good one. He had served in Bechuanaland, having raised a body of irregular horse there. "Paul Methuen," his men called him in those days, and they loved him. He certainly must have known something of the country in which he was to fight and its people. Clery was a *bon vivant* and a man who, it was said, never went anywhere without his cook. He had served in Zululand and written books on tactics. Clery dropped completely out of sight during the war. Gatacre had made a good record in Egypt. Six brigadiers under Buller were Colville, Hildyard, Wauchope (who was killed at the head of the Highland brigade at Magersfontein), Lyttleton, Hart, and Barton. Lieut.-Gen. Sir Forrestier Walker was appointed in command of the lines of communication. An immense fleet of transports was engaged and the work of transporting 50,000 troops to South Africa begun. England had recovered her spirits to a degree. There was talk of a promenade across the veldt, and it was said that the redoubtable Buller would "eat his Christmas dinner in Pretoria." It is only fair to General Buller to say that he indignantly and officially denied ever having made such a statement. Nevertheless, that was the spirit of the press and the people. It was impossible to believe that the great force of British troops to be employed could not wipe the unwilling Boer off the face of South Africa. This force, including the troops of all kinds already in South Africa, would reach 90,000 men at least.

When General Buller reached Cape Town, however, he found chaos. There was no adequate transport for so many men. Ladysmith was in imminent peril, he was led to believe, and the weakness of his character showed itself by his allowing the politicians to induce him to abandon his original plan of campaign — that followed by General Roberts later — and proceed to Natal Colony to relieve Ladysmith. If there is one thing that has been demon-

South African War

strated more clearly than anything else it is that Ladysmith did not really need to be relieved. General White had ample stores, and so long as the Boers could be kept above the Tugela river that was all that was essential. As General Roberts' march showed, the pressure on Ladysmith would be raised the moment a strong British force appeared in Boer territory to the N. Buller, as stated, proceeded to Natal, leaving Lord Methuen with a few thousand troops of the 1st division to proceed to the relief of Kimberley, the city of diamond mines, in which Cecil Rhodes and Colonel Kekewich had been besieged shortly after Mafeking had been surrounded. Over 30,000 troops were consequently diverted to Natal Colony, and a laborious and lumbering campaign was begun there. The spectacle of a British army being repulsed in its first fight by a handful of crack shots was exhibited to the astonished world. On Dec. 15, after a dreary wait, Buller attempted to force a passage of the Tugela river at Colenso to relieve Ladysmith. His guns, under Colonel Long, were ambushed and captured, his attack on the Boer left, led by Hart, also failed and he was compelled to fall back on Chieveley, with a loss in officers and men of 1,111 and 16 guns, besides 286 prisoners. Lord Roberts' only son was mortally wounded trying to save the guns. The shock to British pride was terrible; the nation for a time could not quite realize what the disaster meant. Buller began his dispatch telling of the reverse with the famous sentence, "I regret to report——" and that form of expression became stereotyped in British military dispatches from the scene of war. Buller's army from this time became inert. He did not seem to know how to move, and heliographed the remarkable message to White to surrender Ladysmith, which so astonished the beleaguered general that he thought it a Boer forgery. The exact text of this message which has caused so much controversy, was given to the public some days afterward for the first time. It reads: "As it appears certain that I cannot relieve Ladysmith for another month, and even then only by means of protracted siege operations, you will burn your ciphers, destroy your guns, fire your ammunition and make the best terms possible with the general of the besieging forces, after giving me time to fortify myself on the Tugela."

The serious news from Natal had been preceded by the disaster at Magersfontein, in Cape Colony, where Lord Methuen had been repulsed with loss and the splendid Highland brigade annihilated, General Wauhope, its commander, having been killed in the van of battle, and the repulse of Gatacre at Stormberg in Cape Colony. There were at this time three scenes of action. While Buller was fighting at Natal, Methuen had begun the advance with about 7,500 men to relieve Kimberley, and to Gatacre had been assigned the task of a center advance through Cape Colony across the Orange river, the objective being Bloemfontein, the capital of the Orange Free State. Methuen had advanced to the Modder river, 650 miles N. of Cape Town, after fighting a series of engagements in each of which the Boers were beaten, only to fall back and reoccupy successive kopjes. Belmont, Graspan and Modder river were such engagements, the last fight netting a loss to the British of 476 killed, wounded and missing. On Dec. 11 Methuen tried to surprise the Boer position at Magersfontein. The glaring defect of the army was emphasized here. There had been no proper reconnoitering. The Highland brigade of nearly 3,000 men was caught while marching in close order in the darkness and repulsed, wire entanglement adding to the terrible confusion of the rout. The total losses were 903. On the 9th and 10th, Gatacre in the center had tried to surprise Stormberg at a junction of the railroad running to Bloemfontein, was misled by his guides and driven back with the loss of 656 men taken prisoners and two guns. His other losses were 23 killed and 58 wounded. A statement given out by Mr. Reitz, the state secretary of the Transvaal, concerning this engagement is interesting. He observes that "the Lord's day seems to be a favorite day for the English to attack. The only reason I can assign for this is that on that day the primitive Boer still observes his devotions to the Most High, and is, as it were, taken unawares." The British general must have felt that it was a pity that the primitive Boer had not kept closer to his prayers that day. It may be said here that as a result of this defeat and a subsequent failure to retrieve the disaster at Reddersberg, General Gatacre was ultimately sent back to England; these mistakes ended his military career.

These three reverses opened the eyes of the British government to the sad fact that Great Britain had no officer, if French be excepted, in high command in South Africa who knew military science. Buller, Methuen, Gatacre — all three in chief command in their particular spheres — had proved themselves terrible failures; between them had cost the country no less than 7,987 officers and men killed, wounded and captured, according to the war office figures given out Jan. 19, 1900. In order to understand the condition of affairs at this time, it may be said that Great Britain had in the field or on the way, counting in the local auxiliary forces and the naval brigades, about 100,000 men. With over 30,000 Buller was facing at the Tugela river probably no more than 12,000 Boers, who at the same time were keeping White

South African War

and his 12,000 men cooped up in Ladysmith; Methuen with about 11,000 men — he had been reinforced by Babington's brigade after Magersfontein — was facing Cronje with, at that time, 6,000 or 7,000 Boers at Spyfontein; Gatacre, with about 2,500 men, was in Northern Cape Colony facing about the same number of burghers and rebels; the rest of the British force were guarding the lines of communication or being landed as rapidly as possible, while those Boers not needed immediately at the scenes of action were either making raids at isolated points, besieging outlying garrisons like Mafeking, or looking after their farms, ready to take up their rifles at a moment's notice. The deadlock in the war was complete. A great outcry went up in England for a general to be sent out who knew how to handle an army. Instinctively all eyes were turned to Lord Roberts of Kandahar, the hero of the grand march in an Afghanistan campaign which General Skobeleff, the Russian authority, declared to be one of the most remarkable feats in history, and to Lord Kitchener of Khartum, the pacificator of the Sudan. The government for once did the right thing, and the gazette announced on Dec. 18, 1899, that "as the campaign in Natal, in the opinion of her majesty's government, is likely to require the presence and undivided attention of Gen. Sir Redvers Buller, it has been decided to send Baron Roberts of Kandahar and Waterford as commander-in-chief in South Africa, with Lord Kitchener as chief of staff." Thus was Buller superseded, and with this action there were also ordered to South Africa the 5th, 6th, 7th and 8th divisions, of 10,000 men each, and 10,000 yeomanry volunteers were raised, while the colonies were called upon to send contingents, Canada, Australia and New Zealand responding eagerly.

While Roberts and Kitchener were on their way to Cape Town — they landed there on Jan. 6, 1900 — or busily engaged in Cape Colony organizing an advance, General Buller was making the grotesque attempts to relieve General White at Ladysmith, which gained for him the soubriquet of "The Ferryman of the Tugela." Time and again he crossed over only to be driven back. The most disastrous of his attempts was that of the battle of Spion Kop. General Warren was in immediate command of the troops engaged. He seized the peak known as Spion Kop, which General Buller believed to be the key to the relief of Ladysmith, as guns from this elevation would dominate the Boer camps and enable them to be shelled with ease. This action was taken on the night of January 23. The British held their positions all next day under a fierce Boer fire with heavy and small arms. General Woodgate, who was in command of the summit, was wounded and the officer who succeeded him, Colonel Thorneycroft, decided to abandon the position on the night of January 24. There was some terrific hand-to-hand fighting on this occasion, but Thorneycroft was bitterly censured by Lord Roberts for assuming the authority to vacate a position which should have been held to the last. The British losses were heavy, 40 per cent. of the force holding the kop, a greater loss than any British force ever suffered except probably at the battle of Albuera in the Peninsular War when nearly 4,500 out of 6,000 men fell holding a hill against the French. Including Spion Kop engagement, the total losses of General Buller's force at the Tugela up to January 25, 1900, were about 2,000 men.

In the meantime the fighting in and around Ladysmith had been severe. The Boers several times tried to carry the town by assault and each time were repulsed, but not without loss to the British. On January 6 the fighting at Wagon Hill lasted all day and was often hand-to-hand. General White heliographed that he had lost 149 killed and 271 wounded in this fight and that "the Boer losses were heavier than our own." The Boers were in fact getting desperate; the continued assaults by Buller and the rapid advance by Lord Roberts stimulated the leaders to extra hazardous attempts to get inside the town. From that time on to the final relief it was fighting night and day for the garrison, and fierce artillery duels in which the naval brigade's guns did great work for the defenders. It is just as well to follow out the Ladysmith campaign to its end here. Early in February Buller crossed the Tugela again and failed. He was under imperative orders from Lord Roberts to relieve the town at all costs. He had telegraphed the commander-in-chief the impossibility of doing so without the loss of 2,000 lives, to which he received the curt reply that he must obey orders. Another attempt was more successful. Lord Roberts' operations against Cronje had had their effect. On Feb. 28 Lord Dundonald made a detour with a large body of cavalry and Ladysmith was relieved, having been besieged from Oct. 24, 1899, a period of more than four months. It cost the British to hold and to relieve Ladysmith fully 6,000 men, while the Boer losses were probably half as many. After the relief the rains fell and the whole country round was made ghastly by the corpses from which the earth had been washed. It has been likened to a graveyard. After the relief of the town little of interest occurred in Natal. Buller pushed ahead in his usual lumbering way toward Pretoria, retaking town after town with occasional small engagements and a wearying list of Boer surprises of small bodies of troops. General Joubert was dead; he succumbed on March 27 to the hardships of the Ladysmith campaign added

to the grief with whieh he saw his plans frustrated and the inevitable end of the war foreshadowed. His place was taken by Louis Botha, who had shown a perfect genius for warfare and who never lost an opportunity to harass Buller.

From the moment Lords Roberts and Kitehener landed in Cape Town a radieal change was apparent in the eonduet of the war. They found a great army assembling — more than 180,000 men — for service, but no transport, no means for mobility and a general air of *laissez aller*. As if by magic Kitehener organized a transport serviee that did not impede; system seemed to spring into being, loafers were sent back to England, red tape was ruthlessly severed and the advanee to Kimberley began. On Feb. 12, 1900, for the first time sinee the war opened a British army was inside the Boer frontiers. On that date Lord Roberts, with at least 40,000 infantry, 7,000 eavalry and 150 guns, had turned the Magersfontein lines before which the British forces had been encamped for 10 weeks and made his apparent objeetive Jaeobsdahl in the Free State, lying to the E. of Kimberley. Roberts having kept French and Gataere busy in the Colesberg district had convineed the Boers that the advanee would be by the center. Cronje had 11,000 Boers with him still holding the kopjes between Kimberley and the Modder river. Gen. Heetor Macdonald, a man who had risen from the ranks, having aeeepted a eommission in preferenee to the Vietoria Cross, had reorganized the Highland brigade and had tried it out in various little affairs. With Cronje was Major Albrecht, a German artillerist, whose trained eye told him that Lord Roberts' movement portended ill to the Boers. He advised a retreat, telling the Boer general that he would be flanked and surrounded. Cronje laughed at the idea. "The English," he declared, "eannot leave the railroad." For once Boer calculations were wrong. The British did leave the railroad and one fine day Major-General French, whose work in the Cape Colony had attraeted attention and who had been adroitly ealled from Colesberg and put in eharge of the cavalry of Lord Roberts' eolumn, suddenly with his 7,000 or more sabers dashed around the Magersfontein kopjes in a wide detour without baggage and at great speed. When Freneh reaehed Kimberley the town was saved and Cronje was doomed. Too late the Boer eommander realized his mistake. He beat a hasty retreat, going in the direetion of Paardeberg, on the road to Bloemfontein. Swift as his movements were, however, they were not swift enough. He was overtaken at Paardeberg on Feb. 22 and had to go into laager there for a last stand. The British surrounded the 6,000 Boers who were left, the rest having eseaped in small detachments and 1,500 having retreated N. toward Mafeking. Kitehener eame up and ordered an attaek. This was already under way and 800 British had been killed and wounded when Lord Roberts arrived on the scene and ordered a cessation of the operation. He determined to starve out the Boer general or so to harass him with eontinued rifle and shell fire that he would surrender. For days Cronje held out. Several attaeks were made by De La Rey and other Boer generals outside the British lines to create a diversion. A whole British supply eolumn was captured in one of these engagements, but Lord Roberts was not to be diverted from his purpose. At last Cronje, on Feb. 27, the anniversary of Majuba Hill, surrendered with 4,600 men, all that remained, the rest having escaped in groups and many having been killed. Cronje was deported to St. Helena, the famous prison of Napoleon, and there remained till the end of the war. With him were several thousand of his soldiers.

The eapture of Cronje had a deeisive effeet on the fortunes of the war. It demoralized the Boers left in the field, and, as stated, was the ehief faetor in forcing a retirement of the burghers besieging Ladysmith. It was so sudden and unexpected to the Boers that after it they made no effective resistance to Lord Roberts' advance to Bloemfontein, which he entered on March 13 after a brush at Dreifontein. He telegraphed to his government: "By the help of God and the bravery of her majesty's soldiers the troops under my eommand have taken possession of Bloemfontein. The British flag flies over the presidency whieh was vacated last evening by Mr. Steyn, late President of the Orange Free State . . . . The enemy have withdrawn from the neighborhood." At this time, ineluding Cronje's troops, the losses to the Boer forces were estimated at between 8,000 and 9,000. About this time also was made publie in London a eorrespondenee between Presidents Kruger and Steyn and the Marquis of Salisbury. In their telegram of March 5 the presidents deelared that they had made war solely as a defensive measure, and that if independence were eonceded it would not be eontinued, and that in view of the recent successes of British arms it was an oeeasion to make peace. The reply of the British premier was eharacteristie. The British point of view has never been made clearer than in this doeument. He wrote that a diseussion had been proeeeding for months to obtain redress of the grievanees of British residents; that the republie had in the meantime inereased its armament, and that the British government had therefore been eompelled to send reinforcements to its South Afriean garrisons. He went on: "Suddenly, at two days' notiee, the South Afrean Republic, after issuing an insulting

South African War

ultimatum, declared war upon her majesty, and the Orange Free State, with whom there had not even been any discussion, took a similar step. Her majesty's dominions were immediately invaded by the two republics. Siege was laid to three towns within the British frontier, a large portion of two colonies was overrun with great destruction of property and life, and the Republic claimed to treat the inhabitants of extensive portions of her majesty's dominions as if those dominions had been annexed to one or the other of them. In anticipation of these operations the South African Republic had been accumulating for many years past military stores on an enormous scale, which, by their character, could only have been intended for use against Great Britain.

"Your honors make some observations of a negative character upon the object with which these preparations were made. I do not think it necessary to discuss the questions you have raised, but the result of these preparations, carried on with great secrecy, has been that the British Empire has been compelled to confront an invasion which has entailed upon the empire a costly war and the loss of thousands of precious lives. This great calamity has been the penalty Great Britain has suffered for having of recent years acquiesced to the existence of the two republics.

"In view of the use to which the two republics have put the position which was given them and the calamities their unprovoked attack has inflicted on her majesty's dominions, her majesty's government can only answer your honors' telegram by saying they are not prepared to assent to the independence either of the South African Republic or the Orange Free State."

After resting at Bloemfontein for some time, during which period, besides the 2,000 men who died in camp, there was a recrudescence of Boer activity and a series of humiliating reverses for the British, such as at Sanna's Post where Colonel Broadwood's artillery was ambushed and 425 men and four guns captured, the advance to Pretoria began. It was generally uneventful, being a series of engagements without aim on the part of the Boers, who fell back to the Vaal river, being outflanked at each successive stand by French's cavalry. When Lord Roberts left Bloemfontein he had massed 100,000 men there. He moved on Pretoria with two parallel columns and a strong flanking force of cavalry under the ubiquitous French. The Boers made a spiritless stand at the Vaal, were driven back again, and the British arrived at Johannesburg. The entry was made peacefully after some severe skirmishing in the suburbs of the town. A municipal organization was put in operation immediately, and then Lord Roberts pushed on to Pretoria. President Kruger had left his capital and was conveyed to a convenient point on the Delagoa railroad to enable him to escape into Portuguese territory when hard pushed. Lord Roberts entered Pretoria at the head of 30,000 troops, leading the guards in person as he had promised when in Bloemfontein. The British flag was hoisted on the presidency, and so far as the world was concerned the Boer republics had ceased to exist.

The advance of Lord Roberts from Cape Town to Pretoria was a marvelous feat from a purely physical point of view. The distance was 1,040 miles, and for the three weeks previous to the entry into the Boer capital the troops had been constantly on the march. An eyewitness of the entry said in a description of the scene: "It seemed as if 30,000 cutthroats had marched into the town. They were unshaven, unkempt, shoes worn off their feet, their clothes in tatters, but the way they marched in was a revelation, as if on parade, their legs moving with clockwork-like precision. They looked as if they would cheerfully, if they had been so ordered, follow Kitchener and Roberts in an overland march to Cairo. I am a pro-Boer, but I must confess I never realized what the Boers were up against till I saw those troops." While these operations were going on and after Gen. Archibald Hunter and General Hamilton, with Kelly-Kenny and others in several columns, were rounding up the Boers in the S. part of the Orange Free State, where more of the reverses so common to the British had to be recorded, De Wet succeeded once in cutting Lord Roberts' communications, while at Roodeval and Lindley the Boers captured many men. On July 29, however, 4,000 Boers, under Prinsloo, surrendered to General Hunter, but De Wet escaped. Down on the borders of Basutoland there continued to be some spirited engagements, reverses of the kind familiar to those following the war, sieges, reliefs and hard marches.

Pretoria was occupied by the British on June 5, 1900, and Kruger retired to Machadodorp. On Sept. 1 the Transvaal was proclaimed part of the British empire, and on Sept. 11 Kruger fled to Lorenzo Marques, preparatory to sailing for Europe, both for safety and in order to carry on the intrigues which Dr. Leyds had successfully begun. It has been reported that the Boer leaders had a fund of $30,000,000 deposited in Europe which was being used to corrupt the salable press. President Steyn was still in the field and irreconcilable. He made the S. E. corner of the Free State the theater of his operations, and with Botha and De Wet and De La Rey proved a harassing problem to the British.

After the fall of Pretoria and the flight of Kruger, Field-Marshal Lord Roberts organized the semblance of civil government wherever possible; a plot to assassinate him

South African War

failed, and after the trial of those arrested he returned to England, on Nov. 30, full of honors, but ready to confess to one mistake he had made. He had said publicly that the war as war was at an end, but he retracted this later when the list of British reverses where 400 and 500 troops at a time would be captured, continued to be reported. One of the worst of these was at Nooitgedacht, where Colonel Legg was killed. More recently came the defeat of Lord Methuen, who had decided to stay in the field until the war was over; the capture and wounding of that general seemed to round out the ill luck of this most unfortunate soldier. To Lord Kitchener assisted by Lord Milner, as administrator of the Orange river and Transvaal colonies, was entrusted the task of stamping out the last embers of the war and pacifying the country, but this task was one that has proved more onerous than any assigned to the man who pacified the Sudan. The Boers refused to surrender; they adopted guerilla tactics which necessitated the pouring of troops into South Africa until there were fully 250,000 men there. Most of these guarded the railroads, and those in the field were used in the checkerboard system adopted by Kitchener to corral the Boer commandos. Under this system the whole country was divided up into districts and each district or square was thoroughly swept. Blockhouses were established also and connected by barbed wire fences, keeping the disaffected Boers within certain districts, notably in the N. E. part of the Transvaal and the S. E. part of the Orange River Colony, as it is now called. Great drives were organized and the Boers hemmed in and pushed against the blockhouse line and crushed, or, as often happened, they rushed great herds of cattle against the British lines, and in the confusion and ensuing mêlée escaped for the most part from the traps set for them. Despite many failures, however, Lord Kitchener moved steadily ahead with the arduous work, heeding not the criticism leveled at him.

He adopted the reconcentration camp system, gathering in the Boer families and keeping them prisoners until the fighting heads of the families surrendered. A great outcry, led by Miss Hobhouse and made stronger by the great mortality of infants in the camps, led to a modification of the reconcentration system which originally was identified with General Weyler's methods in Cuba, the difference being, however, that the British had the means to feed their "reconcentrados," while too often Weyler had not. A proclamation issued by Lord Kitchener, calling upon the guerillas to surrender upon pain of confiscation and banishment and worse, was deservedly ridiculed and fell into abeyance. A parliamentary return recently issued showed, however, that 54 Boers had been shot after court-martial for various crimes under military law, including Commandant Scheepers. As Lord Kitchener also had tried and shot the two officers of the Busheveldt Carbineers for the cold-blooded murders of Boer prisoners there was little disposition to condemn his severity toward the Boers charged with similar offenses. Besides the gradual effacement of the Boer commandos by capture and otherwise, until Great Britain now held more than 27,000 prisoners, the death of Cecil Rhodes, who was regarded with peculiar hatred by the Boers as their arch enemy, helped to pave the way for peace. Kitchener, too, exhibited a sagacity in a political sense not expected of him, while in spite of the outcry against Lord Milner the firm refusal to remove him till peace was secured helped to make the Boers see the futility of further contest.

After some months of harassing tactics signs appeared of a disposition among the Boers to seek peace. Rumors came from many quarters, of Botha making overtures or of the terms upon which the irreconcilables would submit. Mr. Kruger had been received at Marseilles with true Gallic enthusiasm, but the French government was cautious, and a polite hint kept the aged president from seeking audience at Berlin of the German emperor. He had numerous public receptions, received many fine speeches, but that was all. The arrival of Messrs. Wolmarans and Wessels in the United States in February, 1902, did not help matters. The government maintained a firmly neutral attitude, and the delegates left impressed with the uselessness of seeking aid either here or in Europe. Talk of peace became more insistent. General Botha and Lord Kitchener met at Middleburg on Feb. 28, but the conference ended without result. A request by the Dutch premier that he be allowed to act as diplomatic agent for the Boers and present proposals of peace had been courteously rejected by the British cabinet. It was shrewdly suspected that Dr. Kuyper's overtures were made to meet the exigencies of domestic politics. They gave the British government, however, the opportunity to state its position and the futility of Boer desires for peace on the basis of independence. The absolute certainty that the most Great Britain would do to bring about peace was to restock farms on a liberal basis and assist the Boers to organize colonial government with some concessions as to the carrying of arms, had its long-hoped for fruits, and the acting vice-president, Schalkburger, with other Boer leaders, met Lord Kitchener at Klerksdorp on April 6 and opened negotiations. The basis on which Great Britain would negotiate was made known to the delegates, who asked for time to lay the matter before

their commandos according to the Boer custom. A cessation of hostilities was refused, but assurances were given that facilities would be allowed for a conference which was held at Vereeniging in the Transvaal, beginning on April 15. After long arguments and differences, a reply was laid before Lord Kitchener and forwarded to Great Britain, and peace finally resulted.

During the whole of the guerilla period of warfare the most striking chiefs on the Boer side were Christian De Wet and General De La Rey, who proved themselves more than a match on many occasions for British columns sent to capture them. They defeated small forces and captured many British, while when great cordons of troops were placed around them, they invariably managed, though sometimes at terrible loss, to break through the British lines. The treatment accorded Lord Methuen by De La Rey struck a chord of popular admiration in the British public and had much to do in smoothing the way to peace. De Wet was popularly supposed to be an embittered man, and there was a curious tradition in some parts of Ireland that he was really Charles Stewart Parnell.

During this remarkable war some episodes stood out in relief. The siege of Mafeking was one. Mafeking was not a strategic point; it was not even a town worth holding, but it was an outpost of the empire, so to speak, and when Baden-Powell, with a handful of men, held it against big odds from the outbreak of the war until May 17, 1901, long after Bloemfontein had fallen, the popular imagination in Great Britain and the colonies became excited. The news from no part of the theater of war was read with more interest than the fights of Mafeking. Mafeking was 200 miles N. of Kimberley, or 850 miles from Cape Town, and it was impossible to relieve it; in fact, from a military point of view it was not essential to relieve it. Baden-Powell became a popular hero, and when the town was finally relieved by Plumer and by the pressure of Lord Roberts' advance, London went wild. "Mafeking night" will long be remembered as the wildest night the great metropolis ever had, far exceeding the demonstrations over the relief of Ladysmith. It seemed as if the long-suppressed feelings of the nation had broken loose. Certainly the rejoicings were more French than characteristic of the Englishman. In fact, the hysterical joy of the English after these events and the apparent gloom after small reverses formed the theme of many a sermon on the change of the national character.

A few words regarding the losses to the British in the Boer war will not be amiss in view of the threat of Mr. Kruger that the price to be paid by Great Britain would "stagger humanity." The figures are indeed very large, but in themselves are not so great as might be imagined, considering the great amount of prejudiced European comment. On April 30, 1902, the official list of British losses since the war began was given out as follows:

Killed—Officers	516
Men	5,211
Wounded—Officers	1,839
Men	20,876
Missing or Prisoners—Officers	385
Men	9,179
Released or Escaped—Officers	378
Men	8,951
Deaths by disease or accident	12,992
Total losses	51,477
Total deaths from all causes	22,069
Sent home as invalids	73,970
Actual reduction of forces	27,732

It may be stated here that those figures were not materially increased afterward. There were later some few small reverses for the British in which some prisoners were taken only soon to be released, and several hundred men were killed or wounded or else died of disease, but for the purpose of estimating the price paid the above official figures are sufficient. It would be hazardous and difficult to give estimates of the Boer losses. They had certainly lost their country and political entity and in those killed and wounded and deaths from disease or accident the number cannot be very much less than 15,000 and might reach 20,000. Add to this that Great Britain held as prisoners some 27,000 and it will be seen that the price that staggers humanity has been paid no less by one side than the other, in proportion perhaps more so by the Boers. The Boer army at the outset was numbered as 50,000 of all arms and if the losses be drawn from this number it will be seen that over four-fifths of the Boer forces had succumbed in the war — a terrible percentage indeed.

In regard to the first three months of the war much was said in criticism of the British troops, most of which may have been justifiable. There is, however, a curious similarity to the first three months of our own Civil War. That period here proved dark as it did in England later. It ended, we are told, "with the South triumphant and confident, the North disappointed but determined." The rout at Bull Run was a terrible blow to Northern pride, as was Buller's repulse at Colenso to British sensibilities. Stonewall Jackson's performances in the short Shenandoah campaign were far and away ahead of those of the Boers. During that brief period Jackson captured 3,199 Federals, 1,000 more than the contingent of British prisoners at Pretoria at the end of the same period. As to the prescience of the British government it may be well to recall General Grant's own words: "Up to the battle of Shiloh," he says, "I as well as thousands of other citi-

South African War

zens believed that the rebellion against the government would collapse suddenly and soon if a decisive victory could be gained over any of its armies . . . but when Confederate armies were collected which not only attempted to hold a line further N. . . . but assumed the offensive . . . then I gave up all idea of saving the Union except by complete conquest."

From a monetary standpoint Great Britain did indeed pay an enormous price, but not more than a very small percentage of her capital. It has been stated that the expenses of the war were $850,000,000,—a colossal sum, but not so much as the capitalization of an American steel corporation. A great percentage of this money was spent in the United States for supplies and horse-flesh and a great deal in the colonies. Much of it, also, was disbursed in South Africa and therefore circulated there. A careful computation, based upon official war office returns, gives the number of troops and the costs of the war as follows:

TROOPS AND COST OF WAR.

	May 1, 1901.	Jan. 1, 1902.
Regulars	138,000	141,000
Colonials	58,000	57,000
Yeomanry	23,000	13,650
Militia	20,000	20,000
Volunteers	10,000	5,400
Total fighters	249,000	237,050
Civilians	30,000	25,000
Grand total	279,000	262,050
Reduction in army in one year		16,950

Duration of war, Oct. 11, 1899, to June 2, 1902, 2 yrs. 7 mos. 22 days.

Cost of war per month in 1900-1901	$27,500,000
Cost of war per month in 1902	22,500,000
Cost of the army in Africa	586,783,500
Total cost of the war	$850,000,000
*Indemnities paid to aliens	$346,500

*Fourteen per cent. of the foreign claims were paid on the adjudication of a commission, the sums paid to each nation being: United States, $30,000; Austria, $75,000; Germany, $150,000; Russia, $20,500; Italy, $60,000; Spain, $750; Sweden and Norway, $5,000; Switzerland, $1,250; Belgium, $4,000.

As compensation for this expenditure of blood and treasure Great Britain has acquired permanently an immense tract of country containing the richest gold fields in the world and vast fertile regions capable of sustaining the overflow of the British Isles. The area of the Orange River Colony is 48,326 square miles, and in 1890 the census showed 77,716 whites and 129,787 natives; the Transvaal has an area of 119,139 square miles, and the population in 1898 was 345,397 whites and 748,759 natives. The Transvaal gold mines have yielded over $350,000,000 in gold and the scientists say that ten times as much more can be taken from the mines. As all of this vast territory is suitable for white life there is no reason to doubt the realization of a huge commonwealth based upon Australasian principles of political freedom wherein all white men, both Boers and British, shall dwell together in amity and unity.

That the British conquerors had no wish to oppress their Boer brethren is shown by the plans of the home government to restock and rebuild the destroyed farms and to institute an administration that some day will take on the form of colonial autonomy — on that day when the war has been forgotten. No stronger proofs of this can be given than the words of Lord Milner himself, who, in denying indignantly that he had ever said, "I am determined to break the dominion of Afrikanderdom." added: "I have always regarded war with the republics as a very formidable war indeed, owing to the colossal armaments of the South African Republic. I could not but anticipate a terrible struggle, the last thing in the world which I or any man could look forward to otherwise than with the gravest solicitude. But as to the after effects of the war, I deprecated the tendency to anticipate a condition of permanent bitterness and hostility between the races. The future would depend on the system adopted when the war was over. With a policy of fair treatment and equal rights the wounds inflicted would heal in time, and there would be no enduring discontent where there was no grievance. Moreover, South Africa would cease to be what the policy of the South African Republic had made it — a huge arsenal — and become, like other young countries, a peaceful agricultural and industrial State, intent upon the material development of its vast resources."

Another feature of the war was the manifestation of the kinship feeling of the colonies. The loyalty with which Canada, Australia and all the other colonies offered men for service in South Africa stirred the nation to its depths and gave birth to an imperial feeling put into verse by Rudyard Kipling and turned to commercial and political advantage by Joseph Chamberlain. A part and parcel of this Anglo-Saxon unity feature of the war was the *rapprochement* between the United States and Great Britain shown in the attitude of neutrality maintained by Washington and the opportunity given by President McKinley to Great Britain to express that nation's attitude toward any outside interference. The appointment of Adelbert S. Hay, son of the secretary of state, as consul at Pretoria, was a wise and diplomatic act of Mr. McKinley. Mr. Hay was sent there after the then Consul Macrum discovered he was too small for the post. The equipoise and ability shown by Consul Hay not only added to the dignity of the United States but gained the admiration of the British government and people. In rendering these conspicuous

South African War

serviees to Great Britain in the face of a hostile European sentiment, Mr. McKinley simply returned in kind the service rendered to this country during the Spanish-American War by the late Lord Pauncefote on behalf of his government. That the American people in general approved of the policy at Washington was shown by the scant hearing given to Webster Davis, the assistant secretary of the treasury, who, while still a government official, went to South Africa, partook of the hospitality of British and Boer alike and then came back to make politieal eapital out of the Boer war as against the administration.

The revelation of the incompetency of the British officer and awful tangle of red tape in the British war office was a result of the war. The government was forced to present a scheme of army reform. Lord Roberts was made commander-in-chief of the army to carry out reforms and remove incompetent officers. Buller was put in command at Aldershot on his return, but was retired for defiance of the war office in a speech at a public dinner. Lord Roberts also urged the formation of rifle clubs as a preparation for volunteer service. Upon the reorganization of the army in 1904–5, and the substitution of the office of inspector-general of the forces for that of commander-in-chief, he became a member of the committee of imperial defense.

As an instance of the helplessness of the war office, it may be said that at one time during the war no more than 3,000 rounds of cartridges were left in the British home arsenals. Mr. Balfour, the first lord of the treasury, is described as having aged several years during the period of anxiety engendered by the knowledge of the unprotected condition of the British Isles. A tremendous lesson of the war in many chapters was the revelation of obsolete methods of training for army officers, the absurdity of frontal attacks on fortified positions, the necessity of scouting, the availability of colonial forces, the inertia of a too abundant commissariat, the mobility of mounted infantry, the non-destruetiveness in proportion to its reputation of lyddite, the uselessness of side arms to officers, the necessity for better marksmanship, individual enterprise, and for the abolishment of the "social pull" in military promotions. How many of these reforms will be instituted is problematical. The side arm in service for officers has been discarded, and a scheme is afoot to use the military resourees of the colonies; but the abolishment of soeial influence may be a more diffieult problem for the authorities —the Buller episode is a case in point. The plan for any reform offered by Mr. Brodrick did not prevent veiled threats of conscription whieh have never become more than threats.

As naval brigades have always been a feature of British wars waged in distant countries, they were not an innovation, but the handiness with which the sailors adapted themselves to strange situations, the ability with whieh they handled their guns, the invention of their offieers in making gun earriages to convey naval rifles by rail, stood out in bold relief to the general lack of initiative of the army officers and men and gained for the British tar the popular name of "The Handy Man."

A result of the war of great interest to commercial circles was the release of at least 1,000,000 tons of shipping employed in the conveyanee of troops and stores to South Africa. The supply of gold, which then steadily increased, reaching four times as much in May, 1902, as in the whole preceding year, will, it is said, reach an amount never before known. Alfred Mosely, the British millionaire, who made his money in South Africa, has been quoted as saying that this stream of gold will be so great that money will draw no greater interest than 1½ per eent. That this source of wealth was not unappreciated by the simple and pastoral Boer is shown by the fact that during the war he extracted from the Rand mines no less than $13,485,865 in pure gold.

Whatever may be the wealth given to the world by the absorption of the Boer republies, to Americans, when once the war was over, there could be no more desirable thing than the realization of such a future as Lord Milner depicts in the language quoted above. That peaee and prosperity may continue in South Africa must be the prayer of every good citizen.

Principal Events of the War.—The Boer war officially began on Oct. 11, 1899, the date set in Kruger's ultimatum. The following are the principal events:

1899.

Oct. 10.—South African republic's ultimatum to England requiring:

First — That all points of mutual difference be regulated by friendly recourse to arbitration, or by whatever amicable way may be agreed upon by this government and her majesty's government.

Second — That all troops on the borders of this republic shall be instantly withdrawn.

Third — That all reinforcements of troops which have arrived in South Africa since June 1, 1899, shall be removed from South Africa within a reasonable time to be agreed upon with this government and with the mutual assurance and guarantee on the part of this government that no attack upon or hostilities against any portion of the possessions of the British government shall be made by this republic during the further negotiations, within a period of time to be subsequently agreed upon between the governments; and this government will, on compliance therewith, be prepared to withdraw the armed burghers of this republic from the borders.

Fourth — That her majesty's troops which are now on the high seas shall not be landed in any part of South Africa.

This government presses for an immedi-

ate and affirmative answer to these four questions and earnestly requests her majesty's government to return an answer before or upon Wednesday, Oct. 11, 1899, not later than 5 o'clock P. M.

It desires further to add that in the unexpected event of an answer not satisfactory being received by it within the interval, it will with great regret be compelled to regard the actions of her majesty's government as a formal declaration of war, and will not hold itself responsible for the consequences thereof, and that, in the event of any further movement of troops occurring within the above-mentioned time in a nearer direction to our borders, this government will be compelled to regard that also as a formal declaration of war.

Oct. 12.— Boers under Joubert invaded Natal, advancing toward Newcastle.
Oct. 13.— British evacuated Newcastle and fell back on Ladysmith.
Oct. 20.— Boers besieged Kimberley. Battle of Glencoe, or Dundee, in Natal. Boers repulsed.
Oct. 21.— Battle of Elandslaagte. Boers defeated by British under General French.
Oct. 24.— Free State force repulsed at Rietfontein by British under General White.
Oct. 29.— Siege of Ladysmith begun by Boers under Joubert.
Oct. 30.— British in sortie from Ladysmith defeated by Boers with a loss of 870 men killed and captured.
Nov. 2.— Railroad and telegraphic communication with Ladysmith cut by Boers.
Nov. 3.— Colenso evacuated by British.
Nov. 6.— Boers shelled Mafeking. Attack repulsed by British under Baden-Powell.
Nov. 16.— British armored train wrecked by Boers near Eastcourt, Natal. Winston Churchill and 56 British captured.
Nov. 25.— General Methuen drove Boers from Graspan after severe fight.
Nov. 28.— Battle of Modder river. Boers defeated by British. Latter's casualties heavy.
Dec. 10.— Boers entrap General Gatacre near Stormberg and inflict on him a loss of 1,000 men killed and captured.
Dec. 10-11.— Battle of Magersfontein. Methuen failed to drive Boers under Cronje from their position. Highland brigade decimated. General Wauchope killed.
Dec. 15.— General Buller lost more than 1,000 men and 11 guns in unsuccessful attempt to cross the Tugela river at Colenso. Lord Roberts' son killed.
Dec. 18.— Lord Roberts ordered to South Africa as commander-in-chief. He selects Lord Kitchener as his chief of staff.

1900.

Jan. 1.— Colesberg captured by General French.
Jan. 6.— Roberts and Kitchener arrive at Cape Town. Boer attack on Ladysmith repulsed with heavy loss to them.
Jan. 23-25.— Battle of Spion Kop.
Feb. 9.— General Buller's third attempt to relieve Ladysmith failed.
Feb. 12.— Lord Roberts invades Orange Free State.
Feb. 15.— General French relieved Kimberley.
Feb. 22-27.— Cronje overtaken in his flight from Kimberley. Captured with 4,600 men and six guns.
Feb. 28.— Ladysmith siege raised. Relieving party under Lord Dundonald entered the town.
March 13.— Bloemfontein, capital of Orange Free State, surrendered to Lord Roberts.
March 27.— Death of General Joubert, Boer commander-in-chief.
May 1.— Lord Roberts entered Johannesburg. President Kruger fled from Pretoria.
May 3.— Lord Roberts' advance on Pretoria begun.
May 17.— Mafeking relieved after a siege of 217 days.
May 28.— Annexation of Free State to British empire proclaimed by Lord Roberts.
June 5.— Pretoria surrendered to Lord Roberts.
July 29.— General Prinsloo and 3,348 Boers surrendered at Naauwpoort.
Aug. 4.— Harrismith surrendered to General Macdonald.
Aug. 17.— Conspirators against life of Lord Roberts tried in Pretoria and convicted. Their leader put to death.
Aug. 28.— Machadodorp, Kruger's second capital, occupied by General Buller.
Sept. 1.— Transvaal annexed to British empire.
Oct. 19. — Kruger flees to Europe.
Nov. 30.— Lord Roberts transfers supreme command in South Africa to Lord Kitchener and departs for England.
Dec. 14.— Sir Alfred Milner (now Lord Milner), formerly British high commissioner for South Africa, appointed administrator of the Orange river and Transvaal colonies.

1901.

Feb. 6.— Botha, with 2,000 men, repulsed in an attack on British under Smith-Dorrien at Orange Camp.
Feb. 22.— Boers, 5,000 strong, defeated by General French at Piet Retief.
Feb. 23.— De Wet's force scattered by Colonel Plumer at Deselfontein, Orange Colony.
Feb. 26.— General French captured 300 Boers and supplies at Middleburg.
March 1.— De Wet driven across Orange river with loss of 280 men captured.
March 8.— Seven days' armistice granted to Boers that General Botha might communicate with other leaders in respect to peace.
April 10.— Negotiations for peace renewed by General Botha.
June 20.— Acting President Schalk-Burger of the Transvaal issued a proclamation: "No peace without independence."
Aug. 7.— Lord Kitchener's proclamation banishing all Boers who had not surrendered by Sept. 15.
Sept. 6.— Loter's entire command captured by British.
Sept. 17.— Three companies of British mounted infantry under Gough ambushed and captured by Boers near Scheeper's Nek.
Oct. 9.— Martial law proclaimed throughout Cape Colony.
Oct. 12.— Commandant Scheepers captured.

1902.

March 7.— General Methuen captured by De La Rey.
March 24.— Official announcement that Transvaal Boers had asked safe conduct to Pretoria to negotiate for peace. Request was granted and a general conference of Boer leaders was arranged.
May 15.— Opening of conference of Boer leaders at Vereeniging to consider terms for peace.
May 31.— Peace concluded.

South America. See AMERICA.

Southampton, a borough and seaport town of England, in the county of Hants, on a peninsula at the mouth of the Itchen, near the head of Southampton Water, 18 miles N. W. of Portsmouth, and 79 miles S. W. of London. It is built on rising ground, and consists of an old and a new town, the former at one time surrounded by walls flanked with towers, of which portions still remain; and entered by several gates, of which three, still standing, bear the names of West Gate, South Gate, and Bar Gate. The last, a remarkable structure, and large enough to contain the town hall in the upper part of it, is now, in consequence of the growth of the town, nearly in its center, and being placed across the principal street, divides it into two

parts, the part to the N. being named Above-bar, and to the S. Below-bar or High street. The streets in the older quarters are very irregular, while those in the more modern portion present many fine ranges of building. St. Michael's, the oldest of the churches, situated in the W. part of the town, is a spacious Norman structure with many interesting features. Other buildings of interest are the Southampton College, the Hartley Institution, the guild hall, custom house, audit house, the theater, philharmonic rooms, assembly rooms, ordnance map office, baths, etc. About 6 miles from Southampton, and 3 miles from Netley Abbey, is the Victoria Hospital for sick soldiers. The first tidal dock was opened for business in 1842. There is ample dock accommodation, and Southampton is the most important mail packet station in the kingdom. The manufactures are chiefly confined to brewing, coach building, iron casting, sugar refining, and shipbuilding. Southampton claims to be a borough by prescription, but its earliest known charter was granted by Henry II. Pop. (1901) 103,500.

Southampton, Thomas Wriothesley, 1st Earl of; born about 1490, and educated at Cambridge, became lord-chancellor of Henry VIII. in 1544. He was one of the executors of the will of Henry. He died in 1550.

Southampton Water, an inlet of the sea, in the S. of England, about 11 miles in length, running from the Solent into Hampshire in a N. W. direction. It receives the rivers Anton, Itchen, and Hamble. The tide water being intercepted each way by the Isle of Wight it has four tides in the 24 hours. The port of Southampton is situated near its head.

South Australia. See AUSTRALIA.

South Bend, a city and county-seat of St. Joseph co., Ind.; on the St. Joseph river, and on the Vandalia, the Michigan Central, the Lake Shore and Michigan Southern, the Chicago and Grand Trunk, and the Indiana, Illinois, and Iowa railroads; 88 miles E. of Chicago. It contains the University of Notre Dame, St. Mary's and St. Joseph's Academies (R. C.), the Catholic Reference Library of America, a public library, high school, Protestant and Roman Catholic Hospitals, street railroad and electric light plants, waterworks, National and savings banks, and daily, weekly, and monthly periodicals. South Bend is particularly noted for the manufacture of sewing machines, agricultural implements, carriages, and wagons. Besides these it has manufactories of furniture, varnish, brick, woolen goods, chinaware, patent medicines, pulp, paper, etc. It has an assessed property valuation of about $14,500,000. The city is built on historic ground. In 1679 La Salle landed here during his exploration of the Mississippi. At that date the place was inhabited by the Miami Indians and later by the Pottawatomies. Pop. (1890) 21,819; (1900) 35,999; (1910) 53,843.

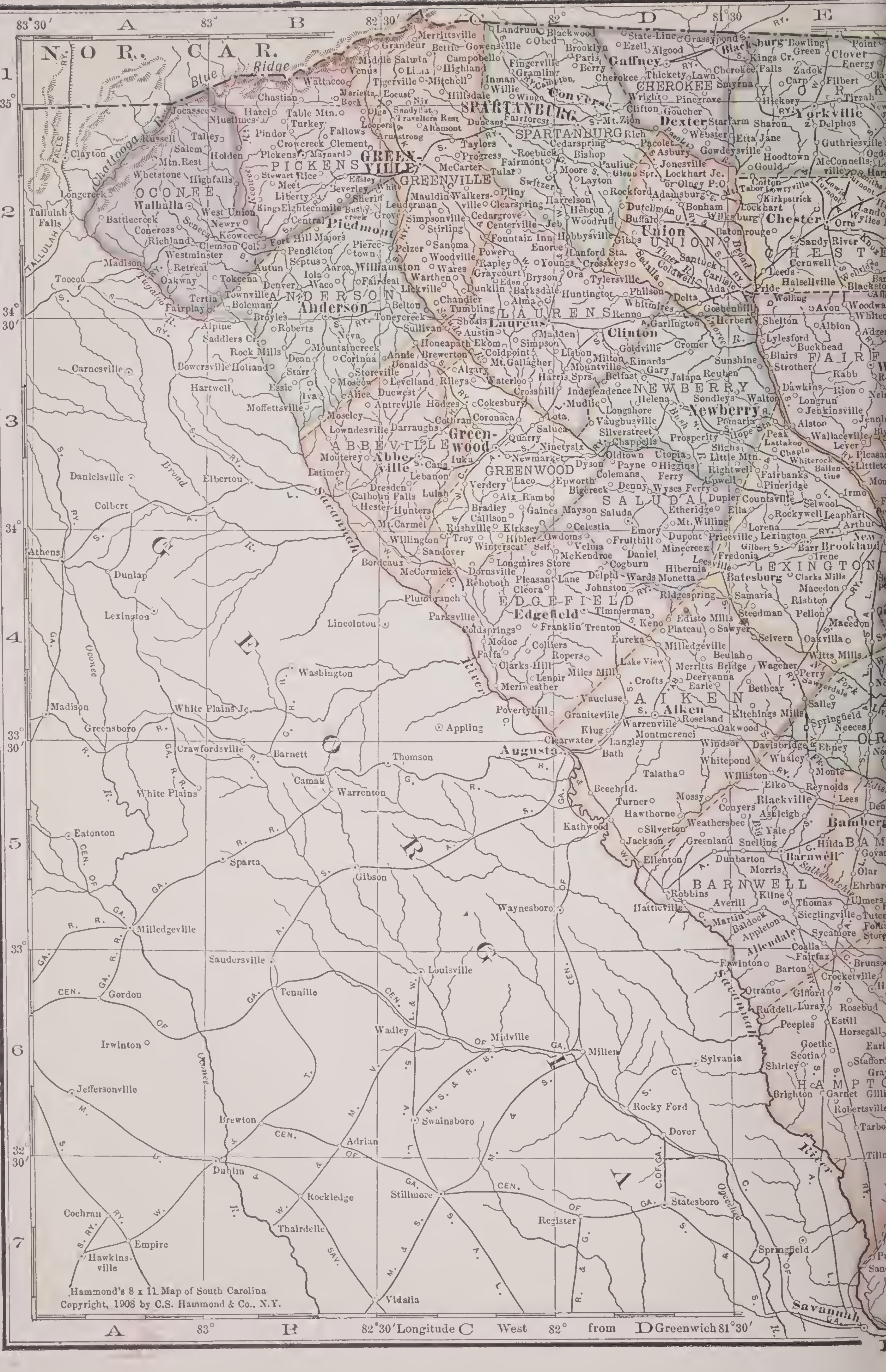
South Bethlehem, a borough in Northampton co., Pa.; on the Philadelphia and Reading, the Lehigh Valley, and the Central of New Jersey railroads; 57 miles N. W. of Philadelphia. It contains LEHIGH UNIVERSITY (*q. v.*), St. Luke's Hospital, waterworks, street railroad and electric lights, National and private banks, and several daily and weekly newspapers. Here are the Bethlehem Iron Works, the Lehigh Valley silk mills, the Lehigh Zinc and Iron Company's plant, and the Bethlehem Foundry and Machine Company. The assessed property valuation exceeds $5,000,000. Pop. (1900) 13,241; (1910) 19,973.

Southbridge, a town in Worcester co., Mass.; on the Quinebaug river, and on the New York and New England railroad; 20 miles S. W. of Worcester. It comprises the villages of Southbridge, Globe, and Sandersdale, and contains public and parochial schools, a public library, National bank, and several weekly newspapers. It has manufactories of boots and shoes, spectacles, cutlery, cotton and woolen goods, etc., and an assessed property valuation of $4,000,000. Pop. (1900) 10,025; (1910) 12,592.

South Britain, England and Wales, as distinguished from Scotland, popularly called North Britain.

South Carolina, a State in the South Atlantic Division of the North American Union; bounded by North Carolina, Tennessee, Georgia, and the Atlantic Ocean; one of the original 13 States; number of counties, 41; capital, Columbia; area, 30,170 square miles; pop. (1890) 1,151,149; (1900) 1,340,316; (1910) 1,515,400.

Topography.— The State has a seaboard of 210 miles, and running W. from this is a low, sandy, and in places, marshy plain, from 80 to 100 miles wide. Beyond this plain is what is known as the middle country, consisting of low sand hills. A series of terraces rises W. of this and terminates in the Blue Ridge Mountains, passing through the N. W. of the State. The highest elevation in South Carolina is Table Mountain, 4,000 feet, on the Tennessee border. The principal river, the Santee, is 150 miles long, and is formed by the junction of the Wateree and Congaree. This latter river is formed by the union of the Broad and Saluda rivers. Other important rivers are Cooper and Ashley, emptying into Charleston harbor; the Edisto and Cambabee into St. Helena Sound; the Great Pedee, Little Pedee, Waccamaw, and Black, emptying into Waccamaw Bay; and the Oosawhatchie into Port Royal Harbor.


NOR. CAR.
Blue Ridge
GEORGIA
OCONEE
PICKENS
GREENVILLE
SPARTANBURG
CHEROKEE
YORK
UNION
CHESTER
FAIRFIELD
ANDERSON
LAURENS
NEWBERRY
ABBEVILLE
GREENWOOD
SALUDA
LEXINGTON
EDGEFIELD
AIKEN
BARNWELL
HAMPTON
Walhalla
Pickens
Greenville
Spartanburg
Gaffney
Yorkville
Chester
Union
Anderson
Laurens
Newberry
Abbeville
Greenwood
Saluda
Edgefield
Aiken
Augusta
Barnwell
Blackville
Allendale
Savannah
Athens
Milledgeville
Waynesboro
Louisville
Millen
Statesboro
Dublin
Savannah River
Hammond's 8 x 11 Map of South Carolina
Copyright, 1908 by C.S. Hammond & Co., N.Y.
Longitude West from Greenwich

SOUTH CAROLINA
SCALE OF MILES
0 5 10 20 30 40
State Capital
County Seats
Size of type indicates relative importance of places
NORTH CAROLINA
ATLANTIC OCEAN
LONG BAY
F G H J K
80°30′ 80° 79°30′ 79° 78°30′
1 2 3 4 5 6 7
35° 34°30′ 34° 33°30′ 33° 32°30′
LANCASTER
CHESTERFIELD
MARLBORO
KERSHAW
DARLINGTON
LEE
MARION
FLORENCE
HORRY
SUMTER
CLARENDON
WILLIAMSBURG
GEORGETOWN
BERKELEY
DORCHESTER
COLLETON
CHARLESTON
BEAUFORT
Lancaster
Chesterfield
Cheraw
Bennettsville
McColl
Dillon
Camden
Bishopville
Darlington
Florence
Marion
Conway
Sumter
Manning
Kingstree
Georgetown
Orangeburg
Monks Corners
Summerville
Walterboro
CHARLESTON
Mt.Pleasant
Beaufort
Monroe
Wadesboro
Rockingham
Hamlet
Laurinburg
Maxton
Lumberton
Fayetteville
Elizabethtown
Whiteville
Chadbourne
Myrtle Beach
Little River Inlet
Murreys Inlet
North Inlet
Georgetown Light
N.Santee Inlet
S.Santee Inlet
Cape Romain
Cape Romain Light
Bull Bay
St.Helena Sound
Hunting I. & Light
Hilton Head I.
Braddocks Pt.
Stono Inlet
Edisto I.
Santee Canal
Cape Fear R.

South Carolina

Geology and Mineralogy.— A geological break passing through the center of the State divides it into two distinct formations. The "up country" in the W. is of Primary origin, and the "low country" in the E. is of Tertiary, with occasional outcroppings of the Cretaceous. The mountain region in the N. W. has gneiss as its characteristic rock, with granite, hornblende, slates, limestones and clay. In 1900 the principal mineral productions were gold, 5,854 fine ounces, valued at $121,000; silver, 400 fine ounces, valued at $248; phosphate rock, 329,173 long tons, valued at $1,041,970; mineral waters, 352,208 gallons, valued at $37,046; granite, valued at $500,802; limestone, $38,415; and clay products $605,229. The State ranks next to Florida in the production of phosphate rock.

Agriculture.— The soil is as a rule either loam or clay, rich in phosphate, lime, and potash. Cotton, maize, wheat, rice, and sweet potatoes are the chief staples. The magnolia and palmetto grow abundantly along the coast, pine and cypress characterize the low country, and hardwoods the highlands. The cotton crop in 1900 was 830,714 bales, that of the Sea Islands being of especially fine quality. The farm crops in 1900 included corn, 13,129,137 bushels, valued at $8,402,648; wheat, 2,142,828 bushels, valued at $2,164,256; oats, 4,023,149 bushels, valued at $1,931,112; potatoes, 333,946 bushels, valued at $335,946; and hay, 192,453 tons, valued at $2,213,210.

Manufactures.— According to the United States census of 1900 the State had 3,762 manufacturing establishments, employing $67,356,465 capital and 49,662 persons; paying $10,782,952 for wages and $34,027,795 for materials used; and having a combined output valued at $58,748,731. The principal industries according to the value of output were cotton manufactures $29,723,919; lumber and timber products, $5,207,184; fertilizers, $4,882,506; cottonseed, oil and cake, $3,103,425; flour and grist mill products, $2,347,790; planing mill products, $1,016,328; rice cleaning and polishing, $973,132; turpentine and rosin, $787,656; railroad cars, $691,361; cotton ginning, $573,823; and brick and tile, $573,438.

State Dispensary.— In 1893 the State began to control the entire liquor traffic under the Dispensary Act of the previous year. In 1901 the purchase of liquor amounted to $1,667,973, and the sale, excluding beer, was $3,328,681. The net profit to the school fund was $120,962; while the net profit to the counties and towns, divided equally, was $424,285. The total net profit was $545,248. In 1902 the Dispensary had $611,354 earned for schools, but which it was then using as a working capital.

Banking.— On Oct. 31, 1901, there were reported 17 National banks in operation, having $2,098,000 in capital; $1,526,278 in outstanding circulation; and $1,481,500 in United States bonds. There were also 31 State banks, with $1,273,427 capital, and $198,851 surplus; and 11 stock savings banks, with $639,000 capital, and $5,785,792 in savings deposits.

Commerce.— The imports of merchandise at the ports of Charleston and Beaufort in the calendar year 1900 aggregated in value $1,579,419; and the exports $9,948,913.

Education.— At the end of the school year 1899–1900 there were reported 497,760 children of school age; enrollment in public schools, 281,891; and average daily attendance, 201,295. There were 4,736 public school buildings, public school property valued at $845,596; and 5,564 public school teachers. For higher education there were 99 public high schools, 31 private secondary schools, 1 public, and 4 private normal schools, 9 colleges for men and for both sexes, and 9 women's colleges. The colleges include Claflin College, at Orangeburg; Woffard College, at Spartanburg; Furman University, at Greenville; South Carolina College, at Columbia; and Newberry College, at Newberry.

Churches.— The strongest denominations in the State are the African Methodist; Regular Baptist, Colored; Regular Baptist, South; Methodist Episcopal, South; Methodist Episcopal; Presbyterian, South; Lutheran, United Synod; Protestant Episcopal; Presbyterian, North; Roman Catholic; Disciples of Christ; Associate Presbyterian; and Methodist Protestant. In 1899 there were reported 4,703 Evangelical Sunday-schools, with 42,080 officers and teachers, and 340,303 scholars.

Postoffices and Periodicals.— In 1901 there were 1,422 postoffices of all grades, and 131 periodicals of which 10 were daily, 1 tri-weekly, 14 semi-weekly, 94 weekly, 2 bi-weekly, 8 monthly, and 2 quarterly.

Railroads.— The total length of railroads within the State on Jan. 1, 1901, was 3,909 miles; of which 173 miles were constructed during the previous year.

Finances.— The total recognized bonded debt on Jan. 1, 1901, was $6,845,777; including $339,208 yet to be funded, and much of which may never be presented. The assessed valuation in 1900 was real estate, $102,148,427; personal property, $52,006,830; railroad property, $24,690,473; total, $178,845,730; tax rate, $5.00 per $1,000. The State owns phosphate deposits which in 1900 yielded $23,460 in royalties.

State Government.— The governor is elected for a term of two years and receives a salary of $3,000 per annum. Legislative sessions are held annually beginning on the second Tuesday in January, and are limited in time to 40 days each. The Legislature has 41 members in the Senate and 123 in

the House, each of whom receives $4.00 per day and mileage. There are 7 Representatives in Congress. In 1902 the State government was Democratic.

History.— The first settlement in South Carolina was attempted in 1562 by a colony of French Protestant exiles, who named it Carolina in honor of their monarch, Charles IX., King of France. In 1663, Charles II., King of England, granted a charter to a company of English nobles, and under their auspices the first successful settlement was made at Port Royal, previously founded by the French. In 1680 the foundation of Charleston was laid. During the Revolution important battles occurred at Charleston, Fort Moultrie, Cowpens, Camden, King's Mountain, and Eutaw Springs. The State constitution was adopted in 1776, and the Constitution of the United States was ratified in 1788. South Carolina was the first State to secede from the Union, on Dec. 20, 1860. The first hostile act in the Civil War was the bombardment of Fort Sumter, in April, 1861. During the war the State suffered greatly, her harbors were blockaded, and much property was destroyed by the Federal soldiers on the great march under General Sherman. In 1865 the ordinance of secession was repealed and slavery abolished. A new constitution, establishing perfect equality between the white and the colored races, was voted in 1869; and in the same year the ratification of the 15th Amendment to the Constitution of the United States being carried by a vote of 18 to 1 in the Senate and 88 to 3 in the House, the State was readmitted to representation in Congress.

South Carolina, University of, a co-educational, non-sectarian institution in Columbia, S. C.; chartered in 1801; opened in 1805; has grounds and buildings valued at over $450,000; scientific apparatus, etc., $20,000; volumes in the library, about 42,000; average number of faculty, 25; average students, 300; graduates, 6,500.

Southcott, Joanna, an English religious visionary; born in Devonshire, England, in 1750. Without any education, she was employed as a domestic servant at Exeter, where she joined the Methodist Church in 1790 and became acquainted with a man named Sanderson who claimed prophetic powers. In 1792 she announced herself as a prophetess, and began to write and dictate prophecies in prose and rhymed doggerel. Soon afterward she declared herself to be the woman spoken of in Rev. xii., and issued sealed papers to her followers which she promised would assure the salvation of the purchasers. She attracted many followers, and went to London on the invitation of Sharp the engraver, where in 1803 were published "A Warning to the whole World from the sealed Prophecies of J. S., and other Communications given since the Writings were opened on the 12th of January, 1803"; in 1804, "Copies and Parts of Copies of Letters and Communications written from J. S. and transmitted by Miss Townley to Mr. W. Sharp in London"; in 1813–1814, "The Book of Wonders in Five Parts"; in 1814, "Prophecies concerning the Birth of the Prince of Peace, extracted from the Works of J. S." She announced that she would be delivered of the Prince of Peace at midnight on Oct. 19, 1814, and a disease under which she suffered favoring the delusion, many persons anxiously awaited the event, and large sums were contributed beforehand. However, she fell merely into a trance, and died Dec. 27 of the same year, with the declaration that, "if she was deceived, she was at all events misled by some spirit, either good or evil." Dr. Reece, her medical attendant, published "A Correct Statement of the Circumstances that attended the Last Illness and Death of Mrs. Southcott" (1815). In 1851 there were in England four congregations of her followers, comprising 198 persons, and a community was founded at Wenthorp in 1857.

Southcottian, a follower of Joanna Southcott (1750–1814), who claimed to be descended from an old Hertfordshire family, but whose own circumstances were so poor that she had to become a domestic servant. She had strong religious feelings, and, till about the age of 40, was a member of the Methodist body. In 1792 she professed to receive revelations, which she published in 1801–1803. These were partly in prose, but chiefly in doggerel. From that time to her death the number of believers in her pretensions largely increased. These were by no means confined to the uneducated classes, and they made such provision for her as enabled her to live in considerable style. In return for their offerings her followers received "seals" — papers which purported to number them with the mystical "hundred and forty-four thousand" of the Apocalypse (vii: 4). In 1813 Joanna announced that she was about to become a mother, that the child would be miraculously conceived, and would be the Shiloh (Gen. xlix: 10) in whom the Millennium was to be established. She died Dec. 27, 1814, and on her tombstone, in Marylebone Churchyard, is an inscription foretelling her reappearance. Shortly before her death, the Rev. J. T. Foley, rector of Old Swinford, on her behalf, announced to her followers that she had received a heavenly command that they were not to assemble for worship till after the birth of Shiloh, but to attend Protestant churches. In 1825 Charles William Twort pretended to be the Shiloh, and another impostor, George Turner (whose followers were called Turnerites), arose about the same time. The last leader of the Southcot-

SOUTH DAKOTA
SCALE OF MILES
0 10 20 30 40 50 60
State Capital
County Seats
Size of type indicates relative importance of places
Hammond's 8 x 11 Map of South Dakota
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NORTH
MONTANA
WYOMING
NEB
HARDING
PERKINS
CORSON
STANDING ROCK INDIAN RESERVATION
DEWEY
CHEYENNE RIVER INDIAN RESERVATION
BUTTE
MEADE
LAWRENCE
PENNINGTON
CUSTER
FALL RIVER
STERLING
ARMSTRONG
STANLEY
WASHINGTON
WASHABAUGH
SHANNON
BENNETT
MELLETTE
LYMAN
PINE RIDGE INDIAN RESERVATION
ROSEBUD INDIAN RESERVATION
BLACK HILLS
Bad Lands
Rapid City
Deadwood
Sturgis
LEAD
Spearfish
Hot Springs
Custer
Edgemont
Belle Fourche
Buffalo
Bison
Fort Pierre
Pierre
Philip
Wall
Interior
Kadoka
Chadron
Crawford
Harrison
Valentine
Cheyenne Agency
Fort Bennett
Pine Ridge
Rosebud
Cheyenne River
White River
Grand River
Moreau River
Bad River
Niobrara River
Slim Buttes
Short Pine Hills
Cave Hills
Harney Pk.
Dodge Pk.
Fannies Pk.
Crow Peak
104° 103° 102° 101°
A B C D
1 2 3 4 5
46° 45° 44° 43°

E
99°
F
98°
G
97°
H
1
2
3
4
5
46°
45°
44°
43°
D A K O T A
S O U T H
M I N N E S O T A
I O W A
R A S K A
Kulm
Wishek
Lehr
Milnor
Gwinner
Stirum
Crete
Harlem
Towanda
Forman
Perry
Ransom
Wahpeton
Breckenridge
Hankinson
Theed
Fairmount
Childs
Yarmouth
Nashua
Red R.
Monango
Fullerton
Yorktown
Clement
Silverleaf
Guelph
Oakes
Cogswell
Rutland
Cayuga
Lidgerwood
Tenney
Tintah
Zeeland
Ashley
Venturia
Ellendale
Ludden
Havana
Hein
Greenway
Artas
Alpha
Sutherland
Longlake
M C P H E R S O N
Eureka
Martel
Leola
Hillsview
Willow
Snake
Wetouka
Delhi
Cr.
Bern
Sutley
Savo
Hecla
Frederick
Maple
Houghton
Sand L.
Detroit
Amherst
Claremont
Westport
B R O W N
Columbia
Huffton
Newark
Marlow
Kidder
Vehlen
Burch
Storm
Britton
Sunnyside
M A R S H A L L
Luffman
Spain
Roy L.
Eden
Buffalo L.
Langford
Stink L.
Lakes
Whipple
Vig
Vernon
Palm
Bethel
Cadwell
Crawford
Bossko
Effington
Winans
Whiterock
Wheaton
Windom
Utto
Sisseton
Minnesota
Lake Traverse
Brown Valley
Graceville
R O B E R T S
Peever
Sisseton Agency
Big Stone Lake
Bullhead L.
Hosmer
Pioneer
Java
Bangor
Bowdle
Roscoe
Ipswich
ABERDEEN
Ordway
Richmond
Putney
Plana
James
Pierpoint
Groton
Bath
Frank
Nutley
Roslyn
Wist
Lohre
Wilson L.
L. Parker
Lynn
Grenville
Waubay
Ellsworth
Wilmot
Hurricane
Sand Cut
Corona
Summit
Bigstone
Ortonville
Odessa
E D M U N D S
Cortlandt
Albion
Rudolph
Nahon
Gem
Andover
Ferney
Bristol
Warner
D A Y
Holmquist
Chautauqua
Webster
Waubay
Prairie L.
St Joseph
Marvin
Milbank
Evergreen
Twinbrooks
Swan L.
Loyalton
Powell
St. Herbert
Mansfield
Stratford
Randolph
Verdon
Butler
Seth
Strand
Strouseton
G R A N T
Yellow Bank
Cr.
Bellingham
Nassau
Marletta
Madison
Lowry
Hoven
Tolstoy
Onaka
Carlysle
Orleans
Roanoke
Bright
Rose
Conde
Crandell
Lily
Lounsberry
Wallace
Kent
Southshore
Dexter
Stockholm
Strandburg
Labolt
Albee
Springs
Millard
Cresbard
Wecota
Chelsca
Northville
Mellette
Brentford
Crocker
Bradley
Helgen
Troy
Florence
Esterly
Rauville
Waverly
Wilson
Revillo
P O T T E R
F A U L K
Seneca
Devoe
Wesley
Talcott
Turton
Julian
Garden City
C O D I N G T O N
L. Kampeska
Yakota
Watertown
Kranzburg
Goodwin
Lonetree Lake
Altamont
Bulkley
Lebanon
Gettysburg
Burkmere
Faulkton
Athol
Ashton
Miranda
Ellisville
Duusmore
Orient
Zell
S P I N K
Grobe
Frankfort
Raymond
Clark
Elrod
Kampeska
Pelican L.
Cactus
Bemis
Moritz
Gary
Canby
Henry
Grover
Appleby
Milford
Goudyville
Tennis
Rockham
Redfield
Doland
C L A R K
D E U E L
Kasper
Zeigler
Sedgwick
Ida
Howell
Iland
Heluiick
Ridge
Boz
Crandon
Irving
Tulare
Dakota
Vandervoort
Golden
Merton
Naples
Hazel
Thomas
Castlewood
Clearlake
Altruria
Norden
Brandt
S U L L Y
Roy
McCamley
Ney
Hawley
Edwin
Afton
Kolda
Burdette
Wolf Cr.
Jolley
Ladelle
Willow Lake
Carpenter
Vienna
H A M L I N
Hayti
Dempster
Togstad
Toronto
Deuel
Astoria
H Y D E
H A N D
Bonilla
Hitchcock
Winthrop
L. Byron
Bryant
Norden
L. Poinsett
Estelline
Medicine Cr.
Holabird
Harrold
Highmore
Ree Heights
Miller
St. Lawrence
Broadland
Lakeside
Bancroft
Spirit L.
Denmark
Erwin
Badger
Laketon
Argo
Grant
Hendricks
Ivanhoe
Osceola
H U G H E S
Canning
Chapelle Cr.
Chapelle
Wessington
B E A D L E
Iroquois
Manchester
Desmet
Lake Preston
Lake Preston
Lake Hetland
Bruce
White
B R O O K I N G S
Yale
Peno
Cedar
Carroll
Wolsey
James Val. Jc.
Huron
Cavour
K I N G S B U R Y
Arlington
Volga
Sioux Val. Jc.
Bushnell
Aurora
Tyler
Fossean
Giddings
Glendale
Danforth
Virgil
Thompson L.
Whitewood
L. Como
Brookings
Elkton
Lake Benton
Degrey
Stephan
Valleyview
Dean
Ames
Bates
Pearl Cr.
Belle
Esmond
Mathews
Drakola
Oldham
Sinai
Crow Creek
Bailey
Medas
Farnsworth
Carthage
Berton
Nunda
McCurdy
Manley
Ward
Indian
Richards
Duncan
Hyde
Templeton
Alpena
Wessington Sprs.
Coruell
Callihan
Marsh
St. Marys
Nansen
Ramona
Leroy
Rutland
Flandreau
Simmons
Lower Brule
Reservation
B U F F A L O
Waterbury
J E R A U L D
Lane
Alwilda
Fedora
Roswell
Vilas
Howard
L A K E
Dyce
M O O D Y
Arlie
Pipestone
Crowcreek
Gannvalley
Fauston
Woonsocket
Forestburg
Artesian
L. Herman
Egan
Estherdale
Glen
Crowlake
Gordou
S A N B O R N
M I N E R
Winfred
Madison
Colman
Trent
Kennebec
Reliance
Grosse
Vega
Lyonville
Storla
Letcher
Amboy
Farwell
Beaver
Canova
Clarno
Orland
Saranac
Chester
Wentworth
Dell Rapids
L Y M A N
Lyman
Dirkstown
Oacoma
Chamberlain
Pukwana
White L.
Finesteel
Loomis
Epiphany
Riverside
Fulton
Farmer
Spencer
Center
Ramsey
Taopi
Colton
Sherman
Red Butte
Houston
Edna
Kimball
A U R O R A
Mt. Vernon
Salem
Hartman
Baltic
Montrose
Pennington
Garretson
Brule
Red L.
B R U L E
White Lake
Plankinton
MITCHELL
Bard
Alexandria
M C C O O K
Humboldt
M I N N E H A H A
Newhope
Renner
Corson
Booge
Red Lake
Ola
Bendon
Newton
Flynn
Stickney
D A V I S O N
H A N S O N
Emery
Canastota
Bridgewater
Hartford
Brandon
Valley Sprs.
SIOUX FALLS
E. Sioux Falls
Iona
Eagle
Dunlap
Rohey
Emsley
Ethan
Wellington
Lake City
Rowena
Shindler
Lester
Pijou Hills
Coyle
Goshen
Dixon
Chandler
Academy
Joubert
Beulah
Harrison
Ebenezer
Hillside
Milltown
Clayton
Black Earth
Dolton
Marion
Vermillion R.
Monroe
Tea
Harrisburg
Chancellor
Waterholes Cr.
Lauro
McLain
T R I P P
Colome
Dallas
River
Day
Hall
Platte
New Holland
Corsica
D O U G L A S
Scott
Parkston
H U T C H I N S O N
Freeman
Parker
T U R N E R
Lennox
Canton
Bloomington
Hummer
Armour
Delmont
Rezek
Wittenberg
Hurley
Worthing
L I N C O L N
Gregory
Mulleu
Lucas
Jasper
Geddes
Hehner
Mansbridge
Tripp
Olivet
Menno
Molan
Centerpoint
Davis
Saddlecreek
Leeville
Fairview
Burke
Starcher
C H A R L E S M I X
G R E G O R Y
Bartholdi
Andes L.
Kennedy
Lake Andes
Scotland
Norway
Mayfield
Viborg
Hooker
Nurey
Moe
Hudson
Centerville
Linden
Herrick
Wheeler
Whiteswan
Morrison
Vodnany
Jamesville
Hanson
Walchtown
Irene
Beresford
Komstad
Alcester
St. Charles
Bonesteel
Scalp
Military Res.
Wagner
B O N H O M M E
Lesterville
Marindahl
Wakonda
Hawarden
Carlock
Ponca Cr.
Fairfax
Echo
Ft. Randall
Avon
Tyndall
Y A N K T O N
Utica
Napa
Sta.
Volin
Lodi
C L A Y
Dalesberg
Alsen
Nora
U N I O N
Bigsprings
Chatsworth
Baker
Reserve
Greenwood
Loretta
Andrus
Springfield
Tabor
Bonhomme
Perkins
Lakeport
Running Water
YANKTON
Missionhill
Wester V.
Gayville
Greenfield
Spink
Garland
Akron
Meckling
Vermilion
Lamont
Lincoln
Burbank
Richland
Westfield
Keya Paha River
Butte
Bristow
Niobrara River
Niobrara
Elkpoint
Newcastle
Jefferson
Sioux R.
Bassett
Newport
Stuart
Vendigris
Center
Bloomfield
Hartington
McCook
Sioux City
Ainsworth
Longpine
Atkinson
O'Neill
Creighton
Laurel
Ponca
Jackson
Dakota
Missouri R.
Coburn
Stafford
Orchard
Ewing
Bruuswick
Plainview
Randolph
Wakefield
Emerson
Wayne
West from Greenwich

South Dakota

tians was John Wroe, of Bowling, near Bradford. He claimed prophetic gifts, and taught that the Second Advent was at hand. His adherents, who are called Christian Israelites, are much stronger in Australia (where Wroe died in 1863) than elsewhere.

South Dakota, a State in the North Central Division of the North American Union; bounded by North Dakota, Minnesota, Iowa, Nebraska, Wyoming, and Montana; admitted to the Union, Nov. 2, 1889; number of counties, 53; capital, Pierre; area, 76,850 square miles; pop. (1890) 328,808; (1900) 401,570; (1910) 583,888.

Topography.— The surface of the E. portion of the State is a level plain, including the great plateau of the Missouri and a similar plateau E. of the James river. W. of the Missouri river the surface is broken, and contains the Black Hills, averaging 6,000 feet in height. This region covers an area of 3,200 square miles, and reaches its greatest altitude in Harney's Peak, 7,368 feet. The chief rivers in the E. section of the State are the Dakota or James, entering from North Dakota, and the Big Sioux, forming part of the E. boundary; both emptying into the Missouri river. W. of the Missouri and also emptying into it are the White, Cheyenne, Grand, and Moreau. There are but few large lakes, Big Stone and Traverse, forming part of the N. E. boundary, being the only ones of any size.

Geology and Mineralogy.— The Black Hills, of Archæan formation, form the center of a system of concentric circles of geological ages. The Palæozoic surrounds the Achæan core, and consists of beds of Potsdam sand and Trenton lime. Around this is a circle of Jurassic and Triassic formations. The Miocene period covers the region W. of the Missouri and S. of the Bad river. The Black Hills contain some of the most valuable mineral deposits in the United States In 1900 the principal mineral productions were gold, 298,842 fine ounces, valued at $6,177,600; silver, 536,200 fine ounces, valued at $332,444; mineral waters, valued at $62,189; granite, $114,115; sandstone, $12,675; limestone, $47,762; natural gas, $9,817; portland cement, $76,000; clay products, $46,500; and mica, sheet, 123,090 pounds, scrap, 258 short tons.

Soil and Agriculture.— The soil is a light but rich loam overlying a fertile clay subsoil, and is especially adapted to raising cereals. Wild fruits grow in great abundance, rich grass covers the prairies in the E. and the Black Hills and Bad Lands afford excellent advantages for dairy farming and stock raising. The principal farm crops in 1900 were corn, 32,418,819 bushels, valued at $9,401,458; wheat, 20,149,684 bushels. valued at $11,686,817; oats, 12,653,266 bushels, valued at $3,036,684; barley, 1,543,571 bushels, valued at $478,507; potatoes, 4,030,841 bushels, valued at $1,451,103, and hay, 2,064,196 tons, valued at $8,153,574.

Manufactures.— According to the United States census of 1900 the State had 1,639 manufacturing establishments, employing $7,578,895 capital and 3,432 persons; paying $1,728,642 for wages and $7,827,110 for materials used; and having a combined output valued at $12,231,239. The most important products according to the value of output were flour and grist, $3,379,843; and cheese, butter, and condensed milk, $1,199,493.

Banking.— On Oct. 31, 1901, there were reported 35 National banks in operation, having $1,657,500 in capital; $693,255 in outstanding circulation; and $647,000 in United States bonds. There were also 195 State banks, with $2,341,918 capital and $314,009 surplus.

Education.— At the end of the school year 1899–1900 the children of school age numbered 124,404; enrollment in public schools, 98,822; and average daily attendance, 68,000. There were 3,776 public school buildings, public school property valued at $2,893,434 and 4,802 public school teachers. For higher education there were 39 public high schools, 7 private secondary schools, 4 public and 1 private normal schools, and 8 colleges. The colleges include the University of South Dakota, at Vermillion; Agricultural College, at Brookings; Augustana College, at Canton; Dakota University, at Mitchell; Yankton College, at Yankton; Huron College, at Huron; Redfield College, at Redfield; and Baptist College, at Sioux Falls.

Churches.— The strongest denominations in the State are the Roman Catholic; Lutheran, Independent Synod; Methodist Episcopal; Congregational; Lutheran, General Synod; Presbyterian; Regular Baptist; Lutheran, Synodical Conference; Protestant Episcopal; Reformed; and Evangelical Association. In 1899 there were reported 800 Evangelical Sunday-schools, with 6,000 officers and teachers, and 48,378 scholars.

Postoffices and Periodicals.— In 1901 there were 694 postoffices of all grades and 273 periodicals, of which 17 were daily, 235 weekly, 3 semi-monthly, and 18 monthly.

Railroads.— The total length of railroads within the State on Jan. 1, 1901, was 2,949 miles, of which 136 miles were constructed during the previous year.

Finances.— The total debt of the State on Jan. 1, 1901, all of which was bonded, amounted to $613,300; sinking and other funds, available for payment of debt, $75,047; net debt, $528,253. The State has taxes due, and unpaid, estimated at $600,000, which when collected will be available for the payment of bonded indebtedness as well as for current expenses. In 1900 the

assessed valuation was $172,255,085, and the tax rate $2.40 per $1,000.

State Government.—The governor is elected for a term of two years and receives a salary of $3,000 per annum. Legislative sessions are held biennially in odd years, beginning on the Tuesday after the first Monday in January, and are limited in time to 60 days each. The Legislature has 45 members in the Senate and 87 in the House, each of whom receives $5.00 per day and mileage. There are two Representatives in Congress. In 1901 the State government was Republican.

History.—The country now known as the Dakotas was acquired by the United States as a part of the Louisiana Purchase. It was partly explored by Lewis and Clarke in 1804 and 1806, by Fremont in 1839, and by Warner in 1855. The Territory of Dakota was created in 1861, and in 1868 Wyoming Territory was formed from part of its area. A scientific expedition, escorted by troops under General Custer, entered the Black Hills in 1874, and gave the first authentic information about the mineral wealth of that region. In 1883 a convention to frame a State constitution for Dakota met at Sioux Falls. Dissensions between the people of the two sections of the Territory followed, and in 1888 it was decided to divide the territorial area into two States, under the names of North and South Dakota. The bill for their admission passed Congress and was signed by the President, Feb. 22, 1889. In 1890-1891 the "Indian Messiah" excitement led to troubles with the Sioux Indians, and in 1892 the Yankton Sioux ceded to the government a large part of their reservation between the Missouri and Choteau rivers.

South Dakota, University of, a coeducational non-sectarian institution in Vermillion, S. D.; chartered in 1862; opened in 1882; has grounds and buildings valued at over $350,000; scientific apparatus, etc., $110,000; volumes in the library, about 16,000; average number of faculty, 50; average student attendance, 450; graduates, over 460; ordinary income, about $118,000.

Southend, an English watering place, at the mouth of the Thames estuary; 42 miles E. of London. It has good level sands, a public hall, and a new pier, over a mile in length.

Southern Alps, the name given to the Central and loftiest portion of the great dividing range of the S. Island of New Zealand. Many of the peaks are perpetually snow-capped, the highest being Mount Cook (13,200 feet). The glaciers of the Southern Alps rival those of the Swiss Alps in magnitude, and on the W. side extend to within a few hundred feet of the sea-level.

Southern California, University of, a coeducational institution in Los Angeles, Cal., founded in 1880 under the auspices of the Methodist Episcopal Church; has endowment exceeding $400,000; grounds and buildings valued at over $250,000; scientific apparatus, etc., $40,000; volumes in the library, over 19,000; average number of faculty, 215; average student attendance, 1,570; graduates, over 1,100.

Southern Education Board. A new and strong force has just been definitely organized to further a general patriotic interest in Southern public school education of each race alike. Out of the Southern Educational Conferences that have for several years been held between Southern and Northern men who regard the education of the masses as the first duty of our time, has grown an organization that has now formulated a definite plan of work. The board of this educational conference consists of both Southern and Northern members, the president being Robert C. Ogden, of New York, whose zeal has found helpful and graceful expression in many acts of direct aid and in the most generous hospitality to earnest workers for this cause.

The organized field work of this board is to awaken and inform public opinion and to secure additional legislation and revenues for the betterment of the public schools, "the supreme public need of our time," in the South, and it is in the hands of a campaign committee of which President Edwin A. Alderman, of the University of Virginia, President Hollis B. Frissell, of Hampton Institute, and other well-known Southern educators and business men were appointed members. These gentlemen were expected to carry on their work in cooperation with the general managers of the John F. Slater and the Peabody Education Funds. Associated with them are other men of like temper and zeal, who regard universal Southern education as the most important patriotic duty of this generation. The function of this board of a wholly voluntary association of Southern and Northern men is not to give financial help to any institution, for it is prohibited by its fundamental resolution to do this. But its task will be to collect accurate information, to disseminate it and to build up public opinion to a greater earnestness.

The one great structural error made by the Fathers in the building of the Nation was the permission of slavery. In our time this error shows itself in the mass of Southern illiteracy. It is on the South that this burden falls, though there is not a man now living in the South or elsewhere who was originally responsible for it. It is the misfortune of our common country, the one serious menace to our homogeneity of citizenship and to the common aim of American life. The neglected white children of the Southern States—particularly

in rural communities — are of the best English and Scotch stock, and they are as capable as the children of our race in any part of the world. They will not contribute their share to the industrial and intellectual and social wealth of the nation unless they are trained. The Negro children, too, who are pathetically eager to learn, can be saved from a low level of inefficient life in no other way. We hear much about Southern natural resources and Southern industrial development which is taking long strides; but there is more potential wealth in the untrained hands and minds of the forgotten masses than in all the forests and mines and wells and rivers of every Southern State.

The time of sectionalism surely is past. Past, too, is the time of the pious missionary whose zeal outran his discretion; past the era of misunderstanding and of misdirected effort; and long past is any care for this creed or that in social or in political action, if only men may grow to their full stature under free government. And now the time is come when Southern and Northern men unite, very largely under Southern leadership, to remove this burden of ignorance for patriotic reasons.

The voluntary movement growing out of the Southern Educational Conferences is of happy augury because it is free from fads and all odor of "professional" reforms, free from all manner of cant and beggary. It makes no appeal for support; it preaches no sermons; it sends no foreign missionaries; it stands for no particular pedagogical doctrine or method; it holds no religious or political creed; it is simply patriotic. Its aim is to encourage the proper free training of every child in the South; and it is interested in the South only because public education there lags farthest behind. Why, more gate money is frequently collected at a great intercollegiate football game than has been spent on the public schools in many a Southern county for ten years; and teachers in many communities receive less money than the men who break stones in the street.

Southern Educational Conference. The annual Southern Educational Conference has come to be a force of national importance. It was held in 1902 at Athens, Ga., and there were in attendance a larger number of men and women of influence from nearly all the Southern States than ever before met for an educational purpose. They included not only the presidents of colleges and the superintendents of schools and men who are directly engaged in educational work, but governors of States, and other men prominent and influential in public life. There went to the conference also a group of men and women from the North-Atlantic States, some of whom represented Harvard, Yale, Columbia, and other universities, and others were men of affairs who have taken a deep interest in the subject on which the conference this year laid emphasis — the building up of the rural public schools.

Southern Educational Conference

It is doubtful whether so earnest a movement for any similar purpose has ever been known in American history. Southern communities are so waking up to the necessity of training the neglected rural population that in North Carolina, for example, meetings are held in the principal towns to lay plans and to secure money by private subscription to equip the public schools in the adjacent country. Good schoolhouses are to be built, handicrafts are to be taught, school gardens cultivated — enthusiasm is unbounded for schools that shall train the children in accordance with the economic needs of the people. Several such rural schools that have already been established in Georgia are working a revolution in the communities where they are. The movement is a movement also for the consolidation of rural schools, making fewer of them and making them better, and for the increase of local taxation for school purposes.

The force and earnestness of the new crusade are indicated by the liberality with which some of the towns and cities, by the private subscriptions of citizens, are spending money for the betterment of rural schools; by the fact that the foremost men and women of these awakened communities go long distances to attend these meetings; by the energy with which the women's clubs (in Georgia, for example) contribute money; and by the energetic interest that even the governors of some of these States have shown in the matter. Governor Aycock of North Carolina, for example, attended the conference at Athens, Ga., and he goes about his own State making stirring public addresses for the better free education of all the people without regard to sex or color or creed. Governor Montague of Virginia shows a similar zeal.

These youthful governors of these two old commonwealths, whose sturdy rural population is an economic resource of greater value than all their fields and mines and forests and industries, have won by their earnest interest in the development of the people the title of "educational governors"; and their great popularity is a fair measure of the earnestness of the people in their purpose to become an integral part of the best-trained population in the world.

For this annual Southern Educational Conference as an institution the gratitude of the whole country is due chiefly to Robert C. Ogden of New York; for, while the conference is the meeting place chiefly of Southern leaders, it is under Mr. Ogden's wise and generous presidency that it has

been developed into a national force. It is an organization that as a voluntary and energetic force purely for patriotic work has but one parallel in our recent history, and that is the Monetary Commission which did such good service for sound currency under the leadership of Hugh H. Hanna of Indianapolis, who by the way is characteristically a member of this Southern Educational Board.

Southey, Robert, an English poet; born in Bristol, England, Aug. 12, 1774. Shortly after leaving Oxford he formed the acquaintance of Coleridge, the two friends marrying at the same time two sisters. After a short visit to Portugal, in 1796, he entered as a student of law at Gray's Inn. In 1801 he devoted himself to literature, and soon after took up his residence at Keswick, in Cumberland, where the remainder of his life was passed, he being thenceforth classed as one of the Lake poets. In 1807 he obtained a pension from the government, and on the death of Pye was appointed poet laureate. In 1839 two years after the death of his wife, he married Caroline Bowles. The latter years of his life were clouded by a mental imbecility which attended him to his death. His chief poems are: "Joan of Arc" (1796); "Thalaba" (1801); "Madoc" (1805); "The Curse of Kehama" (1810); "Roderick" (1814); "A Vision of Judgment" (1821); etc. Among his prose works are: "History of Brazil" (1810); "Life of Nelson" (1813); "Life of John Wesley" (1820); "History of the Peninsular War" (1823); "Sir Thomas More" (1829); "The Doctor" (1834–1837). Among his translations was "The Chronicle of the Cid." His "Commonplace Book," a posthumous publication in four volumes 8vo, is a marvelous monument of his reading and research. He died near Keswick, England, March 21, 1843.

South Georgia, a group of islands in the South Atlantic Ocean, uninhabited, and almost perpetually ice-bound; nearly 800 miles E. by S. of the Falkland Isles, of which they are a dependency; area, 1,000 square miles. Discovered in 1675, they were taken possession of by Captain Cook in 1775; and here in 1882–1883 lived the German expedition for observing the transit of Venus.

South Island, the lower of the two large islands which, with the small Stewart Island, form the British colony of New Zealand.

South Mountain, a ridge of the Alleghanies, near Middletown, Frederick co., Md.; the scene of a battle, Sept. 14, 1862, between the Union troops, under General Reno, composed of Reno's and Hooker's corps of General McClellan's army, and the Confederates, about 30,000 strong, under Generals Hills and Longstreet, in which, after a desperate struggle continuing throughout the day, the Union forces were victorious. General Reno was killed in the action.

South Polar Explorations. See ANTARCTIC OCEAN.

Southport, a watering place of Lancashire, England, incorporated in 1867; on the S. shore of the Ribble estuary, 17¾ miles N. of Liverpool. A fine promenade extends for 960 yards along the spacious sands, and from this projects a pier (1859–1864) 24 feet wide by 1,465 yards long, and traversed by a tramway. Including St. Luke's, Southport has six churches and several of its chapels are fine edifices. Other buildings are a Grecian town hall (1853), the Cambridge Hall (1873) with an assembly room 120 by 50 feet, the Atkinson Free Public Library and Art Gallery (1878), a "Glaciarium," or skating rink of real ice in Queen Anne style (1878), the Victoria Baths, erected at a cost of over $150,000. An elaborate system of sewerage was completed in 1878 at a cost of over $500,000. There are winter gardens (1874), with an aquarium and a band pavilion seating 2,000 persons; botanic gardens (1876), covering upward of 20 acres, and containing a museum; and the Hesketh Public Park (1868) of 30 acres, with a meteorological institute. A small fishing village at the commencement of the 19th century, Southport is now a favorite winter resort for the surrounding manufacturing centers. Hawthorne, who resided here in 1856, describes it in volume iii. of his "English Note-Books." Pop. (1901) 48,083.

South Sea, the Pacific Ocean. The name *Mar del Sur* ("Sea of the South") was bestowed by Vasco Nunez de Balboa, in 1513, because from the spot where he obtained his first view of the great expanse of water, only its S. aspect was visible. The name is still often applied in literature, though with special reference to that part S. of the equator.

South Sea Bubble, a disastrous financial speculation which arose in England in the beginning of the 18th century. It originated with the directors of a joint-stock company, which, in consideration of certain exclusive privileges of trading to the South Seas, offered the government easier terms for the advance or negotiation of loans than could be obtained from the general public. In 1720 the proposal of the company to take over the entire national debt (at this time about $155,000,000) in consideration of receiving annually 5 per cent., was accepted, and the company promised in return for this privilege (as it was regarded) a premium in their own stock of $37,500,000.

Professing to possess extensive sources of revenue, the directors held out promises to the public of paying as much as 60 per cent. on their shares. It became soon apparent that such magnificent promises could never be fulfilled, and in a few months' time the collapse came which ruined thousands.

South Shetlands, a group of islands in the Antarctic Ocean, S. of South America, on the Antarctic circle; originally discovered by a Dutch seaman named Dirk Cherrits in 1599. The islands are uninhabited, and covered with snow the greater part of the year.

Southwark, a parliamentary borough of the county of London, England; extends along the S. bank of the Thames nearly opposite the city of London. For certain purposes it is within the city jurisdiction, and is presided over by an alderman. It returns two members to Parliament. Pop. (1901) 206,128.

Southwell, a town of Nottinghamshire, England, since 1884 a cathedral city, on the ancient Ermine street, seven miles W. by S. of Newark. A church was founded here by Paulinus about 630; but the stately cruciform minster, which with its three towers resembles York on a smaller scale, is wholly of post-Conquest date. Pop. (1901) 3,160.

Southwell, Robert, an English poet; born about 1562; was educated in Paris, and was received into the Society of Jesus in 1578. He was appointed prefect of the English college in Rome; was ordained priest in 1584, and in 1586 returned to England. He became domestic chaplain to the Countess of Arundel and wrote his "Consolation for Catholics" as well as most of his poems at this time. In 1592 he was arrested on a charge of conspiracy against Queen Elizabeth's government, and imprisoned in the Tower for three years. Though thirteen times cruelly tortured, he confessed only his effort to make converts to Romanism. He was tried, found guilty, and hanged at Tyburn, Feb. 22, 1595. His longest poem is "Saint Peter's Complaint"; his most famous, "The Burning Babe."

Southwestern Baptist Theological Seminary, an educational institution in Louisville, Ky.; founded in 1859 under the auspices of the Baptist Church; has endowment of $650,000; grounds and buildings valued at $350,000; volumes in the library, 22,500; average number of faculty, 10; average students, 320.

Southwestern Baptist University, a coeducational institution in Jackson, Tenn.; founded under the auspices of the Baptist Church as Union University at Murfreesboro in 1845; changed to present name and location in 1874; has productive funds exceeding $100,000; volumes in the library, about 8,000; average number of faculty, 20; average student attendance, 300.

Southwestern University, an institution projected by the joint action of the Texas conferences of the Methodist Episcopal Church, South, in 1869, located at Georgetown in 1873, and since that date at the head of the system of schools operated under the control of the Methodist Church in Texas. To Rev. Francis Asbury Mood, D.D., is due the credit of inaugurating this system of schools with this central institution at its head. He was the first president and for twelve years directed its interests. Southwestern University is composed of the college of liberal arts at Georgetown and the medical college at Dallas. In the college of liberal arts the admission requirements are those laid down by the Association of Colleges and Preparatory Schools of the Southern States. Four years of college work is required for the bachelor's degree and one year of post-graduate work for the master's degree. The grounds of the university comprise altogether more than forty-five acres in Georgetown besides ample grounds for the medical college in Dallas. Four of the buildings are imposing structures. Mood hall, the dormitory for men, completed in 1907, cost $65,000. Reported for the year 1906-07: Students, 1,044; volumes in the library, 12,000; endowment, $150,000; grounds and buildings valued at $375,000.

C. C. Cody.

Southwest Kansas College, a coeducational institution in Winfield, Kans.; founded in 1885 under the auspices of the Methodist Episcopal Church; has productive funds, $100,000; grounds and buildings valued at over $70,000; volumes in the library, about 5,000; average number of faculty, 30; average student attendance, 550; ordinary income, about $22,000.

Southworth, Emma Dorothy Eliza Nevitte, an American author; born in Washington, D. C., Dec. 26, 1819; was educated by her stepfather, J. L. Henshaw, at whose school she was graduated in 1835. She taught in a public school in Washington, D. C., in 1844-1849, and while so occupied began to write stories. In 1849 she published the first of her serials, "Retribution," in the "National Era." Her novels, about sixty-six in number, include: "Gloria"; "Nearest and Dearest"; "An Exile's Bride"; "The Fatal Secret"; and others issued serially in the New York "Ledger." She died in Washington, D. C., June 30, 1899.

Souvestre, Émile (soo-vĕstr'), a French author; born in Morlaix, France, April 15, 1806. He wrote: "The Last of the Bretons" (1835-1837); "The Breton Fireside" (1844); "A Philosopher under the Roofs" (1850), crowned by the Academy; "Historical and Literary Conversations"

(1854); and various plays. He died in Paris, July 5, 1854.

Souza, Botelho, Marquise de, ADÉLAIDE MARIE EMILIE FILLEUL, afterward COMTESSE DE FLAHAUT, a French author; born in Château Longpré, Normandy, France, May 14, 1761. At the outbreak of the Revolution she found refuge, together with her only son, first in Germany, then in England, and here learned of her husband's execution at Arras (1793). For solace she turned to writing, and, in the midst of grief and poverty, wrote her first book, the fresh and delightful "Adèle de Sénange" (1794). After Thermidor she tried to return to France, but had to tarry awhile at Hamburg, where she met the Marquis de Souza-Botelho (1758–1825), afterward Portuguese minister at Paris, whom she married in 1802. The charm of her conversation and manners, her bright wit, and above all her goodness made her the queen of a group that numbered many of the most distinguished men in Paris. The Restoration brought her the great grief of a long separation from her son, who had been aide-de-camp to Napoleon. She wrote: "Emily and Alphonso" (1799); "Charles and Mary" (1810); "Eugene of Rothelin" (1808); "Eugenia and Matilda" (1811); and "The Countess of Fargy" (1822). She died in Paris, April 16, 1836.

Sovereign, in politics, the person or body of persons in whom the supreme executive and legislative power of a state is vested. In limited monarchies sovereignty is in a qualified sense ascribed to the king, who though the supreme magistrate, is not the sole legislator. A state in which the legislative authority is not trammelled by any foreign power is called a sovereign state.

Sovereign, a gold coin, the standard of the English coinage. It equals 20 shillings sterling, and has a standard weight of 123.247 grains, being of 22 carats fineness, and coined at the rate of 1,869 sovereigns from 40 pounds troy of gold; worth in United States money $4.8665.

Sovereignty, Popular. See POPULAR SOVEREIGNTY.

Sovereignty of the Sea. Blackstone lays it down that the main or high seas are part of the realm of England, as the courts of admiralty have jurisdiction there. But the law of nations, as now understood, recognizes no dominion in any one nation over the high seas, which are the highway of all nations and governed by the public law of the civilized world. Such a right has, however, long been claimed over the four seas surrounding the British Isles. It was strongly asserted by Selden and denied by Grotius, and measures were taken to vindicate the right in the reign of Charles I. The Dutch claimed the supremacy of the seas in Cromwell's time, but were worsted by Blake. Every nation has undoubtedly a right to the exclusive dominion of the sea within a certain distance from the shore, now fixed at 3 miles. This right of lordship includes the right to free navigation, to fishing, to taking wrecks, the forbidding passage to enemies, the right of flag, of jurisdiction, etc. By the law of England the main sea begins at low-water mark; and between low and high water mark the common law and admiralty have a divided jurisdiction, one on land when left dry, the other on the water when it is full sea.

Sow, in founding, the main trough leading from the tap hole of a cupola or smelting furnace, and from which ramify the passages leading to the separate molds in casting, or to the shallow ditches in the floor which receive the pigs of cast metal. Also the piece of metal cast in this trough; an oblong mass of metal. In military language, a structure of the nature of a movable covered shed, formerly used in sieges to cover and protect men who were employed in carrying on sapping and mining operations.

Sowens, an article of food made from the farina remaining among the seeds (husks) of oats, and much used in Scotland. The husks are steeped in water till the farinaceous matter is dissolved and the liquid has become sour. The whole is then put into a sieve, which allows the milky liquid to pass through into a barrel or other vessel, but retains the husks. The starchy matter gradually subsides to the bottom of the vessel. The sour liquid is then decanted off, and about an equal quantity of fresh water added. This mixture, when boiled, forms sowens.

Sowerby, James, an English author; born in Lambeth, England, in 1757. He was at first a portrait and miniature painter, but became a scientist and published: "English Botany, or Colored Figures of all the Plants Natives of Great Britain (36 vols. 1792–1807; new ed. 11 vols. 1863–1872), the descriptions being written by Sir J. E. Smith, M. D. Other works dealt with fungi, conchology, and mineralogy. He was a fellow of the Linnæan and geological societies. He died Oct. 25, 1822. Three sons who followed in their father's footsteps were James de Carle Sowerby (1787–1871), George Brettingham Sowerby (1788–1854), and Charles Edward Sowerby (1795–1842); and a son of the second was also George Brettingham Sowerby (1812–1884), the author of many illustrated works on natural history.

Sow Thistle, the popular name given to a species of a genus of composite plants, *Sonchus.* There are about 50 species, mostly herbaceous, but some forming shrubs or small trees. Some of the first may be considered cosmopolitan, while the woody sorts are almost restricted to the Canaries and to the island of Madeira. The most common species in Great Britain is the common sow-thistle, *Sonchus oleraceus.* It is very abundant as a weed, is greedily fed upon by many animals, and is sometimes used on the European continent as a pot-herb. It grows to a height of two or three feet, with a branching stem and small yellow flowers. The *S. alpinus* forms a tall and fine plant, with fresh and sharply defined foliage and large heads of beautiful blue flowers. The *S. arvensis* is found in Massachusetts and Southern New York.

SOW THISTLE.

Soy, a thick and piquant sauce made from the seeds of the soy bean (*Soja hispida*), a plant of the natural order *Leguminosæ,* sub-order *Papilionaeeæ.* It is a native of China, Japan, and the Moluccas, and is much cultivated in China and Japan. It is also common in India, though probably not a native of that country. The seeds resemble those of the kidney bean and are used in the same way. The Japanese name is *Shoyu.* Soy is made by mixing the beans softened by boiling with an equal quantity of wheat or barley roughly ground. The mixture is covered up and kept in a warm place to ferment, then put into a pot and covered with salt. Water is poured over the mass, and it is stirred at least once a day for two months, after which the liquor is poured off and squeezed from the mass. filtered, and preserved in wooden vessels.

Soyer, Alexis, a French cook; born in Meaux, France, in 1809. He was the most famous cook of his time, and chef of the Reform Club (1837–1850). For a time he managed a "symposium" or restaurant of his own. He went to Ireland during the famine of 1847; contributed greatly to improving the food of the army and navy; and in 1855 went to the Crimea to reform the food system under which the army was suffering. His works greatly increased the public interest in economic, scientific, and tasteful cookery, and comprised: "Culinary Relaxations" (1845); "Charitable Cookery (1847); "The Gastronomic Regenerator" (1846; 9th ed. 1861); "The Modern Housewife" (1849; 36th thousand, 1866; new ed. 1872); "Shilling Cookery-book" (1854; 123d thousand, 1858). He wrote also an account of his experiences in the Crimea. He died in England, Aug. 5, 1858.

Soymida, in botany, a genus of *Swieteneæ;* sepals five, petals five, shortly clawed; stamen tube cup-shaped, 10-lobed; anthers 10; stigma peltate, five-cornered; ovary five-celled, many-seeded; fruit a woody, five-valved capsule, with winged seeds. Only known species (formerly *Swietenia*) *febrifuga,* the Indian redwood. It is a tree, about eight feet high, with abruptly pinnate leaves, and the flowers in large terminal panicles, growing in jungles in Central India and the Deccan. The bark is deep red and half an inch thick; it contains a gum, is very astringent, and given by the Hindus in fever, diarrhœa, dysentery, and gangrene. It is used in small doses in fever and typhus. The bark is employed in India in tanning, and the timber for plowshares, etc.

Spa, or **Spaa,** a town of Belgium, and a watering place of world-wide celebrity; in a romantic valley amid hills which form part of the Ardennes chain, 27 miles S. E. of Liege, and 22 miles S. W. of Aix-la-Chapelle. The prettily-built town consists almost entirely of inns and lodging houses. The mineral springs, seven in number, are all chalybeate, and contain minute quantities of iron, so combined with alkaline salts and carbonic acid gas as to be both easiiy digested and agreeable to the palate. They are cold, bright, and sparkling, and are efficacious in complaints of the liver, nervous diseases, dyspepsia, etc. Spa water is exported to all quarters of the globe. The other springs are in the vicinity of the town and most of them are situated amid picturesque plantations. Spa is also famed for the manufacture of wooden toys, which are stained brown by being steeped in the mineral waters. It was frequented as a watering place as early as the 14th century, and has given its name to many mineral springs.

Space, in geometry, the room in which an object, actual or imaginary, exists. All material objects possess length, breadth, and thickness; in other words, they exist in space of three dimensions. Plane surfaces have only two dimensions — length and breadth, and straight lines but one dimension — length. Hence we have notions of space of one dimension and of two di-

mensions, as distinguished from the three dimensional space in which we live. The question has arisen, and has been warmly discussed, as to whether space of four, and perhaps of higher dimensions exists. Zöllner believes that it does, and that some persons have some of the power of beings living in space of four dimensions, and thus accounts for many of the phenomena of Spiritualism. For example, while a being living in space of two dimensions could only get in or out of a square by passing through one of its sides, a human being could enter the square from above; so, he argues, a person having the properties of a four-dimensional being could enter or leave a closed box or room on its fourth-dimensional side. In metaphysics, a conjugate of material existence. Empirical philosophers maintain that notions of space are derived from our knowledge of existence; transcendentalists that these notions are innate.

In music, one of the four intervals between the five lines of a staff. They take their names from the notes which occupy them; thus, the spaces of the treble staff, counting upward, are F, A, C, and E, and of the bass, A, C, E, and G.

In physics, the room in which the Cosmos or universe exists.

"As to the infinity of physical space, or the infinity of actual material existence, all that we can say is, that however far we advance (and we have advanced a great deal) in the power of discerning distant objects, we have uniformly found new objects to discern, and we have, therefore, good analogical reason for supposing that no limit can be assigned to their still further existence. This view of what is commonly called the infinity of space is further supported by the fact that metaphysical space as a conjugate of material existence in no way precludes the possibility of its infinite extension."—Brande & Cox.

In printing, the interval between words in printed matter; also pieces of type-metal shorter than type, used to produce such spaces or to separate letters in words, of varying thickness, so as to justify the line.

Spada, Lionello, an Italian painter; born in Bologna, Italy, in 1576. He became the pupil of Caravaggio, with whom he traveled. Among his works (which are well known in European galleries) St. Dominic burning the heretical books, and an altar piece in the church of St. Dominic at Bologna, are considered the best. He died in Parma in 1622.

Spadaite, an amorphous mineral inclosing wollastonite, occurring in nodules in the leucitic lava of Capo di Bove, near Rome; hardness, 2.5; luster, greasy; translucent; color, approaching flesh-red. An analysis yielded: Silica, 56.0; alumina, 0.66; protoxide of iron, 0.66; magnesia, 30.67; water, 11.34 = 99.33, corresponding to the formula $(\frac{5}{6}\,MgO + \frac{1}{6}\,HO)\,SiO_2 + \frac{1}{2}HO$.

Spade, an implement for digging; also performed with a pronged fork or with a steam digger. The spade or fork is thrust in with the foot, and the mass of earth is first loosened by the lever-power of the handle, then lifted and inverted. When this operation is performed in spring or summer, the ground should be dry, so as to obtain pulverization as easily and to as great extent as possible. In stronger soils, which are dug in autumn, a little moisture is desirable, as the land lies fallow and the frosts of winter afterward pulverize and reduce it to a proper degree for receiving the crops in spring. Digging by hand is mainly confined to the cultivation of gardens and small "crofts," for, though a most efficient means of cultivating the soil, it is too expensive for field crops. It is resorted to, however, for digging over or trenching land which has been in timber or full of stones or boulders. Formerly the spade was the only implement used for digging, but steel forks are now more largely used, being lighter and more easily driven into the soil. Besides preparing the land for plants, the spade and the fork, chiefly the latter, are used for taking crops, such as potatoes and carrots, out of the ground.

Spade Guinea, an English guinea having a spade-shaped shield bearing the arms on the reverse. They were coined from 1787 to 1799 inclusive, and the last coinage of guineas, which was from new dies, took place in 1813.

Spadix, in botany, a kind of inflorescence in which unisexual flowers are closely arranged around a fleshy rachis or imbedded in its substance. The rachis often terminates above in a soft, club-shaped, cellular mass extending far beyond the flower. The spadix is found only in *Araceæ* and palms; in the former it is fleshy, in the latter woody. It is uniformly surrounded by a large bract called a spathe. In zoölogy, an organ consisting of four tentacles which have coalesced in the males of the tetrabranchiate cephalopods. The normal number being 12, eight remain free.

Spagirist, a term employed by the alchemists to denote an operator on metals; or, more generally, a chemist in search of the philosopher's stone. In old medicine, a name applied, chiefly in France to those practitioners who in the 16th century made extensive use of mineral medicines.

Spagnoletto, a celebrated painter, whose true name was Giuseppe Ribera, or Ribeira; born in Xativa, Valencia, Jan. 12, 1588. He was at first a pupil of Caravaggio, but afterward improved himself by the study of the works of Raphael and Correggio at Rome and Parma. Settling in Naples he was appointed court painter, in which post he took the leading part in an infamous

plot against his rivals Carracci, D'Arpino, Guido, Domenichino, etc.. Ribeira excelled in the representation of terrible scenes, such, for example, as the "Flaying of St. Bartholomew." His works are not uncommon in European galleries. He died in Naples in 1656.

Spahis, or **Sipahis,** the name given to the irregular Turkish cavalry which is said to have been organized by Amurath I., and which gave place in 1826 to regular cavalry. Their usual arms were the saber, lance, and javelin. The French call a body of light cavalry raised in Algeria by the name of spahis. The name sepoys given to the native troops in British India is the same word.

Spain, a kingdom in the S. W. of Europe, forming with Portugal the great S. W. peninsula of Europe. It is separated from France on the N. E. by the chain of the Pyrenees, and is otherwise bounded by Portugal and the Atlantic and Mediterranean. In greatest breadth N. and S. it measures 540 miles; greatest length E. and W., 620 miles; total area, 196,173 square miles; pop. (estimated 1909) 19,712,585. Spain retains practically none of her once magnificent colonies. The war with the United States deprived her of Cuba, Porto Rico, the Philippine and Sulu islands, and Guam; and a treaty with Germany, Feb. 8, 1899, of the Marianne (or Ladrone), Caroline, and Pelew islands. On Nov. 8, 1900, Spain sold the islands of Cagayan and Sibutu to the United States for $100,000. Her last remaining colonies are in Africa with pop. 136,000. Spain formerly comprised the ancient kingdoms and provinces of New and Old Castile, Leon, Asturias, Galicia, Estremadura, Andalusia, Aragon, Murcia, Valencia, Catalonia, Navarre, and the Basque Provinces. These since 1854, for administrative purposes, have been divided into 49 provinces, including the Balearic and Canary Islands. The capital is Madrid; next in population are Barcelona, Valencia, Seville, and Malaga.

Physical Features.—The coast line is not much broken, but sweeps round in gentle curves, presenting few remarkable headlands or indentations. The interior is considerably diversified, but its characteristic feature is its central table-land, which has an elevation of from 2,200 to 2,800 feet, and a superficial extent of not less than 90,000 square miles. It descends gradually on the W. toward Portugal; but on the E., toward the provinces of Catalonia and Valencia, it presents an abrupt steep or line of cliffs, with the character of an ancient sea margin. It is bounded on the N. by the Asturian and Cantabrian Mountains, reaching an elevation of about 8,500 feet; on the S. by the Sierra Morena; and is crossed from E. to W. by the Douro, Tagus, and Guadiana rivers. Between these limits it is intersected by two important ranges of mountains running nearly E. and W., the N. being the Guadarrama with its continuations, separating the valleys of the Douro and Tagus, and attaining in one of its peaks a height of 8,200 feet; and the S., the Sierra de Toledo and its continuation between the Tagus and the Guadiana. S. of the Sierra Morena is the valley of the Guadalquivir river. Besides these ranges there is the chain of the Pyrenees, which, though partly belonging to France, presents its boldest front to Spain and has its loftiest summits within it. The highest peak in the ranges is La Maladetta or Pic de Nethou (11,165 feet); but the highest peak in Spain is Mulahacem (11,705 feet), belonging to the Sierra Nevada in the S. The latter chain possesses some of the wildest scenery in Europe. The chief rivers enter the Atlantic, but in the N. E. is the Ebro, a tributary of the Mediterranean. The Douro, Tagus, and Guadiana belong partly to Portugal. The lakes are few and unimportant.

Minerals.—The whole country teems with mineral wealth, the minerals including in greater or less quantities gold, silver, quicksilver, lead, copper, iron, zinc, calamine, antimony, tin, coal, etc. The exploitation of the minerals has, however, in recent times been mostly accomplished by foreign capital, while most of the ore is exported to foreign countries in its raw state. In 1900 the value of the mineral production was $57,714,681.44; and the value of the minerals at the mines, $26,914,274.65. The most important mineral was iron ore, total value $5,406,632.29.

Climate.—The climate varies much in different localities. On the elevated tableland it is both colder in winter and hotter in summer than usual under the same latitude. In the plains and on the coasts the hot summer is followed by a cold rainy season, terminating in April in a beautiful spring. The mean temperature at Malaga in summer is 77° F., in winter 57°; at Barcelona 77° and 50°; and at Madrid 75° and 44.6°. The rainfall is small; in the interior between 8 and 12 inches per annum. In some parts of the S. the climate is almost tropical. The hot S. wind of Andalusia, known as the solano, and the cold N. wind called the gallego, are peculiar to Spain.

Vegetable Products and Agriculture.—About one-sixth of the acreage is under wood; the more remarkable trees being the Spanish chestnut and several varieties of oak, and in particular the cork oak. Fruits are extremely abundant, and include, in addition to apples, pears, cherries, plums, peaches, and apricots, the almond, date, fig, orange, citron, olive, and pomegranate; and

Spain

in the lower districts of the S., the pine-apple and banana. The culture of the vine is general, and great quantities of wine are made, both for home consumption and exportation. The more important farm crops are wheat, rice, maize, barley, and legumes. In the S. cotton and the sugar cane are grown. Hemp and flax, esparto, the mulberry for rearing silk worms, saffron, licorice, are also to be mentioned. The only large animals in a wild state are the wolf, common in all the mountainous districts, and the bear and chamois, found chiefly in the Pyrenees. Domestic animals include the merino sheep in great numbers, horses, mules, asses, horned cattle, and pigs.

Manufactures and Commerce.— The manufactures of Spain are not as a whole important, but considerable advances have been made in recent times. The most important industries are the manufacture of cotton, woolens and linens, cutlery and metal goods, paper, silk, leather, tobacco, and cigars, besides wine, flour, and oil. Since the loss of her colonies most of Spain's manufacturing interests have suffered severely. The chief articles of export are wine (by far the first), fruits (especially oranges and raisins), cork, lead, iron ore, oils, soap, and agricultural produce (including cattle and wool). In 1899 the total imports amounted to $187,301,225; exports were $144,977,750. The chief trade is with France, next to which is England. The country is imperfectly provided with roads; the rivers are of little use for navigation; and though railways have a considerable aggregate length (about 8,000 miles), much is still required. The chief denomination of money is the peseta, of which about 25 are equivalent to $5.

Government.— By the constitution of 1876 Spain is declared a constitutional monarchy, with executive power vested in the king, and the legislative power in the Cortes with the king. The Cortes consists of a Senate and Congress. The Senate is composed of three classes: Those who sit by right of birth or official position, members nominated by the crown (these two classes not numbering more than 180 together), and 180 elected by the largest taxpayers of the kingdom and certain corporate bodies. The Congress contains 431 deputies, elected by citizens of 25 years of age who have enjoyed full civil rights in any municipality for two years. Each province has its own parliament, and each commune its own elected ayuntamiento presided over by the alcalde, for municipal and provincial administration. In 1899 the revenue was $177,199,640; expenditures $181,090,365; national debt $1,963,264,625. For defenses, see *Armies of the World* under ARMY; and *Navies of the World* under NAVY.

People and Religion.— The people of Spain are of very mixed origin, the most ancient inhabitants, the Iberians (now represented probably by the Basques or Biscayans of the N. E.), being afterward mingled with Celts, Phœnicians, and Carthaginians, Roman colonists, Goths, Jews, and Arabs or Moors. They are generally of medium height and of spare habit, with black hair, dark eyes, and sallow complexion. Under the constitution the State binds itself to maintain the Roman Catholic religion, but a restricted liberty of worship is permitted to Protestants, of whom, however, there are very few. There are nine archbishops, the Archbishop of Toledo being primate. Houses for monks no longer exist, having been abolished by law in 1841. In 1857 an elaborate scheme of education (including compulsion) was proclaimed by the government, but never enforced; and education is in a very backward state. Recently, however, there has been a more efficient supervision, and there are over 30,000 public and private schools. There are also government schools for engineering, agriculture, fine arts, music, etc., and 10 universities.

History.—Spain was first known to the Phœnicians, subsequently to the Carthaginians, and, in the 3d century B. C., to the Romans. It was completely subdued under Augustus, after which it enjoyed tranquillity for nearly 400 years. This state of peace was disturbed by the irruption of the Northern barbarians, the Suevi, the Vandals, and the Alani. Christianity was introduced about the end of the 6th century; the invasion of the Moors took place in the beginning of the 8th; and they overran the whole country except the Asturias. They were finally expelled in 1492. Under Charles V., Spain made a great figure in the general affairs of Europe. He reigned 40 years, and in 1556 abdicated in favor of his son, Philip II., who died in 1598 and bequeathed to his successor, Philip III., Belgium, Naples, Sicily, and Portugal. Charles II., the last prince of the Austrian branch, reigned from 1668 to 1700; after which began the well-known war for the succession to the Spanish dominions, in which the claim of Austria was supported by the grand alliance against Louis XIV. Notwithstanding the opposition of the Allies, however, the grandson of Louis XIV. reigned in Spain, relinquishing the Belgic provinces to the house of Austria. Philip V., the first king of the French line, had a long and turbulent reign. After him Ferdinand VI., a prudent prince, introduced various reforms and maintained peace, but dying in 1759 his son, Charles III., went to war with Great Britain. Peace ensued in 1763 and continued till 1778, when Spain, at first neutral in the American War of Inde-

pendence, was prevailed on to take up arms against England, and obtained, at the peace of 1783, the Floridas and the island of Minorca. Charles IV. succeeded to the crown in 1788, became soon after a party to the coalition against Republican France; but was, after Prussia, the first of the Great Powers to conclude a treaty of peace, in 1795. In little more than a year afterward, the cabinet of Spain joined its late opponent and declared war against England. The abdication of the royal family of Spain took place at Bayonne in May, 1808. It was followed by the general resistance of the inhabitants, by the invasion of their country by Napoleon I., and by the subsequent expulsion of the French by the troops of Great Britain combined with those of Portugal and Spain. The dissatisfaction and indignation excited by the tyrannical proceedings of Ferdinand led, in the beginning of 1820, to a revolution of great importance, by which the constitution of the Cortes, as established in 1812, was restored, and such salutary restraints established on the power of the crown as seemed best calculated for securing the rights of the people. In 1823 Spain was again invaded by French troops under the Duke d'Angoulême, whose object was to put down the new government and to restore Ferdinand to absolute power. They penetrated the country without resistance; and having laid siege to Cadiz, the king was given up to them, and afterward the town. In 1833, on the death of Ferdinand VII., the queen-mother, Christina, was appointed queen-regent during the minority of her daughter Isabella, to whom, by his will, he bequeathed his throne. On this, Don Carlos, the late king's brother, laid claim to the crown, when a civil war which lasted till 1840 ensued. In that year the partisans of Don Carlos were finally defeated. The next event of importance was the contest between Espartero, the regent, and the Queen-Dowager Christina, for the supreme power during the minority of the queen. Espartero was successful from 1840 to 1843, but was compelled to flee before O'Donnell and Narvaez, and was not restored till 1847. Espartero's success obliged Christina to retire to France, whence she returned after his fall, Narvaez and the Moderados having control of the government. Isabella was now declared of age. married her cousin, Francis of Assisi, and succeeded to the throne as Isabella II. During her reign the Liberals and Conservatives successively gained control of the government. The disputes finally ended in a successful revolt of the Liberals, the queen being obliged to fly to France, and the throne being offered in 1870 to Amadeus, a son of Victor Emanuel. Finding his task too difficult, he resigned in 1873. A republic was now formed, with Castelar as its leading spirit, but it was soon brought to an end, and the throne was offered in 1874 to Alphonso, the young son of the exiled Queen Isabella. Alphonso XII. died in 1885; and on the birth of a posthumous son, May 17, 1886, the regency was intrusted to his widow, Christina. In 1902 this son came to the throne under the title of Alphonso XIII. See CUBA: PEACE TREATIES: SPANISH-AMERICAN WAR.

Spalacidæ, in zoölogy, mole rats; rodent moles; a family of *Myomorpha*, straglingly distributed over the Eastern Hemisphere. General form cylindrical; eyes and ear-conchs very small or rudimentary; tail short and rudimentary. There are two subfamilies: *Bathyerginæ* and *Spalacinæ*.

Spalato, or **Spalatro,** a town of Dalmatia, Austria; on a promontory on the E. side of the Adriatic; 160 miles S. E. of Fiume. Here in a most beautiful situation the Emperor Diocletian built for himself a colossal palace, to which he retired when he abdicated the throne in 305. The palace faced the sea, looking S.; its walls were from 570 to 700 feet long and 50 to 70 feet high, and inclosed an area of 9½ acres. It stood square, like a Roman camp, and had a gate in the middle of each side, and was of the most solid construction. Architecturally it is of the highest interest in that it contains several features that presage the architectural styles and devices of modern times..

Within the palace area is a building supposed to be the mausolem of the emperor. Since the year 650 this edifice has been a Christian cathedral; it contains a magnificent marble pulpit. All the interior buildings and nearly all the exterior walls of this gigantic palace are still standing in a fairly good state of preservation. But the interior was converted into a town in 639 by the citizens of Savona who escaped the destruction of their town by the Avars, and it has been occupied ever since. The existing city of Spalato lies, more than half of it, outside the palace walls. It contains a museum rich in the remains of Savona, and has a lively trade in grain, cattle, oil, horses, etc., the Lasva railway (1895–1897) connecting it with Bosnia and the Danubian lands. Its industries embrace the manufacture of liquors (rosoglio and maraschino), bricks, ropes, etc.

Spalding, a Dutch-looking town on the Welland in Lincolnshire, England; 14 miles S. W. of Boston. It has a fine church (Decorated and Perpendicular), built in 1284 and restored by Sir G. Scott, who also planned two of the remaining three churches in the town. The grammar school, of which Bentley was master in 1682, was founded in 1568; new school buildings were erected in 1881. Ayscoughfee Hall, dating originally from 1420, was the residence of the antiquary Maurice Johnson, who help-

ed to found the Society of Antiquaries and the Spalding Gentlemen's Society (1710; resuscitated in 1889). This town had a castle and a monastery prior to the Conquest. The latter eventually became a priory (1051), attached as a cell to Crowland; the ruins of the chapel (1300) at Wykeham (3 miles from Spalding) belonged to a country house of the priors. The river is navigable up to this town for vessels of 70 tons. Spalding is an important railway center and has an active trade in the agricultural produce of the fertile fens. Pop. (1901) 9,385.

Spalatin, Georg, a German historian; born in Spalt, Bavaria, in 1484; was originally named Burckart, but called himself Spalatin from his native place. After studying at Nuremburg, Erfurt, and Wittenberg, he became (1507) pastor at the village of Hohenkirchen near Gotha. In 1512 he was appointed university librarian at Wittenberg, and in 1514 court chaplain and privy secretary at Dresden, in which post he had great political influence as the most trusted counsellor of the elector. He greatly advanced the cause of the Reformation as "superintendent" at Altenburg, where he died Jan. 16, 1545. The chief works of Spalatin are his biographies of Friedrich the Wise (new ed. by Neudecker and Preller, Jena, 1851) and Johann the Constant, his "Christliche Religionshändel," his history of the Popes and emperors of his time, and his letters.

Spalding, John Lancaster, an American clergyman; born in Lebanon, Ky., June 2, 1840; was educated at St. Mary's College, Emmetsburg, Md., in Belgium and in Rome; was chancellor of the diocese of Louisville, Ky., in 1871; was Roman Catholic Bishop of Peoria, Ill., after 1877. He did much to establish educational institutions in this country. Besides "Essays and Reviews" (1876), he has published a "Life of Archbishop Spalding" (1872); "Religious Mission of the Irish People" (1880); "Lectures and Discourses" (1882); "America, and Other Poems"; "The Poet's Praise"; "Education and the Higher Life"; and "Songs, Chiefly from the German"; and "Means and Ends of Education."

Spalding, Martin John, an American clergyman, born near Lebanon, Ky., May 23, 1810; was graduated at St. Mary's College in 1826, and in 1830 entered the College of the Propaganda in Rome; was ordained priest in 1834; became Roman Catholic Bishop of Louisville, Ky., in 1849, and Archbishop of Baltimore in 1864. In 1866 he was apostolic delegate and convened the Second National Council of the Roman Catholic Church at Baltimore; and was a promient member of the Vatican Council (1870–1871). He was distinguished as a controversialist and polemical writer, and published many works; among them: "D'Aubigné's History of the Reformation Reviewed" (1844); "Lectures on the General Evidences of Christianity" (1847 and 1866); "Miscellanies and Reviews" (1885); and "History of the Protestant Reformation in Germany," etc. (2 vols. 1860). He also edited "The General History of the Catholic Church," by Abbé Darras (4 vols. 1860). He died in Baltimore, Feb. 7, 1872.

Spallanzani, Lazaro, an Italian naturalist; born in Scandiano, Italy, Jan. 12, 1729. After studying at Reggio di Modena and Bologna he was in 1754 appointed to the chair of logic, metaphysics, and Greek at Reggio, and soon afterward was transferred to Modena. But he took the greatest interest in natural history and physiological questions. He disproved the doctrine of spontaneous generation. In 1768 he was appointed Professor of Natural History in the University of Pavia, and keeper of the museum, which he greatly enriched with fishes, crustacea, and testacea, the fruits of his numerous excursions. In 1785–1786 he spent nearly a year in Turkey engaged in scientific observation, and during the year 1788 visited Naples while Vesuvius was in eruption, the Lipari Isles, and Sicily, and wrote an account of his inquiries, "Travels in the Two Sicilies" (6 vols. 1792). In "Dissertations on Animal and Vegetable Physics" (2 vols. 1870), he clearly demonstrated the true physiological nature of digestion, and established, on the basis of experiment, the respective functions of the spermatozoa and the ovum in reproduction. He died of apoplexy, Feb. 11, 1799.

Span, a measure of length, being the distance between the tips of the thumb and little finger when the fingers are expanded to their fullest extent. This space averages about 9 inches, which accordingly is the fixed measure given to the span.

Spandau, a town and first-class fortress of Prussia; situated at the confluence of the Havel and the Spree; 8 miles W. by N. of Berlin. The principal defense of the capital on that side, it has very strong modern fortifications, including a citadel. In the "Julius tower" of this structure is preserved in gold the "Reichskriegsschatz" $30,000,000 that the government, according to a law of 1871, keeps in reserve for a great war. Spandau is the seat of large government cannon foundries, factories for making gunpowder and other munitions of war, and has an arsenal. The town, one of the oldest of Brandenburg, was a favorite residence of the electors. It surrendered to the Swedes in 1634, to the French in 1806, and in 1813 to the Prussians. Pop. (1905) 70,301.

Spandrel, in architecture, the space over the haunch of an arch and between it and the outscribing rectangle; between the estrados of an arch and the square head or dripstone over it; also, the space between the outer moldings of two arches and the string-course above them. When timber arches support a roadway, the spandrels contain upright posts with diagonal stays. The posts transmit the load to the arch.

Spangles, metal ornaments, used chiefly for theatrical dresses, and consisting for the most part of thin circular pieces of gilt or silvered tin.

Spanheim, Friedrich, a German theologian; born in Amberg, Bavaria, Jan. 1, 1600; studied at Heidelberg and Geneva; visited Paris and England; was appointed in 1631 to the chair of theology at Geneva, in 1641 at Leyden. He wrote: "Disputation on Universal Grace"; etc. He died in Leyden, April 30, 1648.

Ezechiel Spanheim, son of the foregoing; born in Geneva, Switzerland, Dec. 7, 1629; studied at Leyden, and was appointed Professor of Rhetoric there in 1651. He next became tutor to the sons of the Elector Palatine, and with them traveled in Italy and Sicily. In 1665 he represented the Palatinate and Brandenburg as resident in England; in 1680 he went for nine years to Paris as ambassador extraordinary. He took part in the peace of Ryswick, later went on missions both to Paris and London, and died Nov. 7, 1710. He had great learning in the history of ancient law and in numismatics, and wrote a treatise on "Ancient Coins" (1706–1716); and "The Roman World" (1704).

Friedrich Spanheim, his brother; born in Geneva, May 1, 1632; studied at Leyden, was appointed to the chair of theology at Heidelberg in 1655, at Leyden in 1670. He defended Calvinism against Descartes and Cocceius. His collected works fill three volumes (1701–1703). He died in Leyden, May 8, 1701.

Spaniel, the name given to several varieties or breeds of dogs. Their distinguishing characteristics are a rather broad muzzle, remarkably long and full ears, hair plentiful and beautifully waved, particularly that of the ears, tail, and hinder parts of the thighs and legs. The prevailing color is liver and white, sometimes red and white or black and white, and sometimes deep brown, or black on the face and breast, with a tan spot over each eye. The English spaniel is a superior and very pure breed. The King Charles' dog is a small variety of the spaniel used as a lapdog. The Maltese dog is also a small species of spaniel. The water spaniels, large and small, differ from the common spaniel only in the roughness of their coats, and in uniting the aquatic propensities of the Newfoundland dog with the fine hunting qualities of their own race. Spaniels possess a great share of intelligence, affection, and obedience, which qualities, combined with much beauty, make them highly prized as companions.

Spanish-American War, a war between the United States and Spain that began April 21, 1898, that date being named in an Act of Congress passed on April 25, declaring that a state of war existed. Spain issued a declaration of war on April 24. Hostilities ended with the signing of a protocol by the Secretary of State for the United States and M. Cambon, the French ambassador, acting for Spain, on Aug. 12, 1898. The final treaty of peace signed by the commissioners in Paris, Dec. 10, 1898, was signed by President McKinley Feb. 10, and by the Queen Regent of Spain March 17, 1899. The war lasted 114 days. In that time the United States land and sea forces destroyed two Spanish fleets, received the surrender of more than 35,000 Spanish soldiers, took by conquest the fortified cities of Santiago de Cuba, in Cuba, Ponce, in Porto Rico, and Manila, on the island of Luzon, in the Philippines, and secured control, pending negotiations of peace, of the entire Spanish possessions in the West Indies, the Philippines, and Guam of the Ladrone Islands. The Americans suffered no loss of ships or territory and but 279 killed and 1,465 wounded in battle, while the cost to Spain, aside from prisoners, ships, and lost territory, was 2,199 killed and 2,948 wounded. The cost to the United States in money was $141,000,000.

The principal events preceding and during the war and the dates on which they occurred are as follows:

Feb. 15 — The United States battle ship "Maine" was blown up in the harbor of Havana. According to the report of the Court of Inquiry appointed by the United States the explosion was due to an external mine.

April 20 — President McKinley, authorized by Congress to intervene in Cuba, using the United States military and naval forces, sent an ultimatum to Spain. The Spanish minister at once left Washington, and the next day the United States minister left Madrid.

April 22 — A proclamation was issued by the President blockading the principal ports of Cuba.

April 23 — President McKinley issued a call for 125,000 volunteers to serve for two years.

April 27 — The batteries of Matanzas, Cuba, were shelled by Admiral Sampson's flagship, the "New York," with the monitor "Puritan" and the cruiser "Cincinnati."

April 29 — The Spanish fleet, commanded by Admiral Cervera, consisting of the "Cristobal Colon," the "Almirante Oquendo," the "Maria Teresa," and the "Viscaya," and the torpedo boats "Furor," "Terror," and "Pluton," left the Cape Verde Islands for Cuba.

May 1 — Commodore Dewey, commanding the United States Asiatic squadron, destroyed the entire Spanish fleet in Manila Bay, Philippines, without losing a man.

May 11 — The "Wilmington," "Winslow," and "Hudson" engaged the Spanish batteries at Cardenas. Ensign Bagley and four of the "Winslow's" crew were killed. Maj.-Gen. Wesley Merritt was ordered to the Philippines as military governor.

May 12 — A United States fleet, commanded by Rear-Admiral Sampson, bombarded the fortifications of San Juan, Porto Rico.

May 19 — Admiral Cervera's fleet reached Santiago de Cuba, and a few days later was "bottled up" there by the "flying squadron" of Commodore Schley.

May 25 — President McKinley called for 75,000 more volunteers. Twenty-five hundred United States troops sailed from San Francisco for Manila, several thousand more following later.

May 31 — The "Massachusetts," "Iowa," and "New Orleans" bombarded the fortifications at the mouth of Santiago harbor. They were bombarded again several times after Admiral Sampson took command of the fleet.

June 3 — Assistant Naval Constructor Hobson with seven men ran the collier "Merrimac" to the mouth of Santiago harbor and sank her in the channel under the fire from the Spanish forts. Hobson and his men were taken prisoners.

June 10 — Six hundred marines were landed at Caimanera, Guantanamo Bay, Cuba, where sharp skirmishing continued for several days, several Americans being killed.

June 12 — The 5th Army Corps, commanded by General Shafter, sailed from Tampa on 29 transports for Santiago, arriving off there on June 20.

June 13 — President McKinley signed the War Revenue Bill, providing for the raising of revenues by a stamp tax and providing for a popular bond loan.

June 17 — A Spanish fleet under Admiral Camara left Cadiz for the Philippines, but returned after passing through the Suez Canal.

June 22 — General Shafter's troops began disembarking at Baiquiri and Siboney, near Santiago.

June 24 — Roosevelt's Rough Riders were attacked while advancing toward Santiago; 16 Americans were killed and 40 more wounded before the Spaniards were repulsed.

July 1 — General Lawton took El Caney, near Santiago, and General Kent, commanding the 1st division of the 5th Army Corps, which included the 2nd, 6th, 9th, 10th, 13th, 16th, and 24th infantry, and the 71st New York volunteers, took San Juan Hill after heavy fighting. Official reports gave the American losses 231 killed and 1,364 wounded and missing.

July 3 — Admiral Cervera's squadron made a dash out of Santiago harbor, and every vessel was sunk or disabled by the American fleet. General Shafter demanded the surrender of Santiago. The seizure of Guam, in the Ladrone Islands, by the "Charleston" was reported.

July 7 — President McKinley signed resolutions passed by the Senate annexing the Hawaiian Islands to the United States, and the "Philadelphia" was ordered to Honolulu to raise the American flag.

July 17 — General Toral, in command of the Spanish troops at Santiago, General Linares being wounded, surrendered his forces and the E. portion of the province of Santiago de Cuba to General Shafter.

July 20 — Gen. Leonard R. Wood, formerly colonel of the 1st Volunteer cavalry, was appointed military governor of Santiago.

July 25 — United States troops, under Gen. Nelson A. Miles, landed at Guanica, Porto Rico, the town having surrendered to the "Gloucester" after a few shots.

July 26 — Through the French ambassador, the government of Spain asked President McKinley on what terms he would consent to peace.

July 28 — Ponce, the second largest city in Porto Rico, surrendered to General Miles, and he was received by the residents with joyful acclamations. Capture of several other towns, with little or no fighting, followed.

July 30 — President McKinley's statement of the terms on which he would agree to end the war was given to the French ambassador. The President demanded the independence of Cuba, cession of Porto Rico and one of the Ladrones to the United States, and the retention of Manila by the United States pending the final disposition of the Philippines by a joint commission.

Spanish-American War

July 31 — United States troops engaged the Spaniards at Malate, near Manila, in the Philippines, and repulsed them, with some loss on both sides.

Aug. 9 — The French ambassador presented to President McKinley Spain's reply, accepting his terms of peace.

Aug. 12 — Protocols agreeing as to the preliminaries for a treaty of peace were signed by Secretary Hay and the French ambassador. United States military and naval commanders were ordered to cease hostilities. The blockades of Cuba, Porto Rico, and Manila were lifted and hostilities were ended.

Aug. 13 — Manila surrendered after a combined assault by the army under General Merritt and Dewey's fleet.

For detailed accounts of the principal events of the war, see CUBA: MANILA BAY, BATTLE OF: PEACE TREATIES: SANTIAGO MILITARY CAMPAIGN: SANTIAGO, NAVAL BATTLE OF; together with the principal persons and places concerned therein.

Cuban Natal Day.—It will be remembered that the war was undertaken on the part of the United States, in the language of the joint resolution of Congress, approved April 20, 1898, "for the recognition of the independence of the people of Cuba, demanding that the government of Spain relinquish its authority and government in the island of Cuba and withdraw its land and naval forces from Cuba and Cuban waters, and directing the President of the United States to use the land and naval forces of the United States to carry these resolutions into effect."

The intentions of the United States government were consummated on May 20, 1902, when the affairs of the island were formally turned over to the regularly-elected representatives of the new Cuban Republic by the United States authorities. The warrant for this action was the following order by the Secretary of War to General Wood, the military governor of Cuba:

War Department,
Washington, March 24, 1902.

Sir: You are authorized to provide for the inauguration on May 20 next of the government elected by the people of Cuba, and on the establishment of said government to leave the government and control of the island of Cuba to its people, pursuant to the provisions of the act of Congress entitled, "An Act making appropriation for the army for the fiscal year ending June 30, 1902," approved March 2, 1901.

On the transfer of government and control to the President and Congress so elected you will advise them that such transfer is upon the express understanding and condition that the new government does thereupon and by the acceptance thereof, pursuant to the provisions of the appendix to the constitution of Cuba, adopted by the constitutional convention on June 12, 1901, assume and undertake all and several the obligations assumed by the United States with respect to Cuba by the treaty between the United States of America and her majesty the Queen Regent of Spain, signed at Paris on Dec. 10, 1898.

It is the purpose of the United States government, forthwith on the inauguration of the new government of Cuba, to terminate the occupancy of the island by the United States, and to withdraw from that island the military forces now in occupancy thereof, but for the preservation and care of the coast defenses of the island, and to avoid leaving the island entirely defenseless against external attack, you may leave in the coast fortifications such small number of artillerymen as may be necessary, for such reasonable time as may be required to enable the new government to organize and substitute therefor an adequate military force of its own, by which time it is anticipated that the naval stations referred to in the statute and in the appendix to the constitution above cited will have been agreed on, and the said artillerymen may be transferred thereto.

You will convene the Congress elected by the people of Cuba in joint session at such reasonable time before May 20 as shall be necessary therefor, for the purpose of performing the duties of counting and rectifying the electoral vote for President and Vice-President under the LVIIIth Article of the Cuban Constitution. At the same time you will publish and certify to the people of Cuba the instrument adopted as the constitution of Cuba by the constitutional convention on Feb. 21, 1901, together with the appendix added thereto, and forming a part thereof, adopted by the said convention on June 12, 1901. It is the understanding of the government of the United States that the government of the island will pass to the new President and Congress of Cuba as a going concern; all the laws promulgated by the government of occupation continuing in force and effect, and all the judicial and subordinate executive and administrative officers continuing in the lawful discharge of their present functions until changed by the constitutional officers of the new government. At the same moment the responsibility of the United States for the collection and expenditure of revenues and for the proper performance of duty by the officers and employes of the insular government will end, and the responsibility of the new government of Cuba therefor will commence.

In order to avoid any embarrassment to the new President which might arise from his assuming executive responsibility with subordinates whom he does not know, or in whom he has not confidence, and to avoid any occasion for sweeping changes in the civil service personnel immediately after the inauguration of the new government, approval is given to the course which you have already proposed of consulting the President-elect, and substituting before May 20, wherever he shall so desire, for the persons now holding official positions, such persons as he may designate. This method will make it necessary that the new President and yourself should appoint representatives to count and certify the cash and cash balances and the securities for deposits transferred to the new government. The consent of the owner of the securities for deposits to the transfer thereof you will, of course, obtain.

The vouchers and accounts in the office of the auditor and elsewhere relating to the receipt and disbursement of moneys during the government of occupation must necessarily remain within the control and available for the use of this department. Access to these papers will, however, undoubtedly be important to the officers of the new government in the conduct of their business subsequent to May 20. You will accordingly appoint an agent to take possession of these papers, and retain them at such place in the island of Cuba as may be agreed on with the new government till they can be removed to the United States without detriment to the current business of the new government.

I desire that you communicate the contents of this letter to Mr. Palma, the President-elect, and ascertain whether the course above described accords with his views and wishes. Very respectfully,

ELIHU ROOT,
Secretary of War.

Brigadier-General Leonard Wood, Military Governor of Cuba, Havana, Cuba.

The issue of this order was followed on March 27 by the following message to Congress from President Roosevelt, seeking authority for the establishment of diplomatic relations with the new republic:

To the Congress of the United States:

I recommend to the Congress timely consideration of measures for maintaining diplomatic and consular representatives in Cuba, and for carrying out the provisions of the act making appropriation for the support of the army for the fiscal year ending June 30, 1902, approved March 2, 1901, reading as follows:

"Provided further, that in fulfillment of the declaration in the joint resolution approved April 20, 1898, entitled, 'For the recognition of the independence of the people of Cuba, demanding that the government of Spain relinquish its authority and government in the island of Cuba, and to withdraw its land and naval forces from Cuba and Cuban waters, and directing the President of the United States to use the land and naval forces of the United States to carry these resolutions into effect,' the President is hereby authorized to 'leave the government and control of the island of Cuba to its people' as soon as a government shall have been established in said island under a constitution which, either as a part thereof or in an ordinance appended thereto, shall define the future relations of the United States with Cuba, substantially as follows:

I.

"That the government of Cuba shall never enter into any treaty or other compact with any foreign power or powers which will impair or tend to impair the independence of Cuba, or in any manner authorize or permit any foreign power or powers to obtain by colonization, or for military or naval purposes or otherwise, lodgment in or control over any portion of said island.

II.

"That said government shall not assume or contract any public debt, to pay the interest on which, and to make reasonable sinking fund provision for the ultimate discharge of which, the ordinary revenues of the island, after defraying the current expenses of government, shall be inadequate.

III.

"That the government of Cuba consents that the United States may exercise the right to intervene for the preservation of Cuban independence, the maintenance of a government adequate for the protection of life, property, and individual liberty, and for discharging the obligations with respect to Cuba imposed by the treaty of Paris on the United States, now to be assumed and undertaken by the government of Cuba.

IV.

"That all acts of the United States in Cuba during its military occupancy thereof are ratified and validated, and all lawful rights acquired thereunder shall be maintained and protected.

V.

"That the government of Cuba shall execute, and as far as necessary extend, the plans already devised, or other plans to be mutually agreed on, for the sanitation of the cities of the island, to the end that a recurrence of epidemic and infectious diseases may be prevented, thereby assuring protection to the people and commerce of Cuba, as well as to the commerce of the southern ports of the United States and the people residing therein.

VI.

"That the Isle of Pines shall be omitted from the proposed constitutional boundaries of Cuba, the title thereto being left to future adjustment by treaty.

VII.

"That to enable the United States to maintain the independence of Cuba, and to protect the people thereof, as well as for its own defense, the government of Cuba will sell or lease to the United States lands necessary for coaling or naval stations at certain specified points, to be agreed on with the President of the United States.

VIII.

"That by way of further assurances the government of Cuba will embody the foregoing provisions in a permanent treaty with the United States."

The people of Cuba having framed a Constitution embracing the foregoing requirements, and having elected a President who is soon to take office, the time is near for the fulfillment of the pledge of the United States to leave the government and control of the Island of Cuba to its people. I am advised by the Secretary of War that it is now expected that the installation of the government of Cuba and the termination of the military occupation of that island by the United States will take place on May 20 next.

It is necessary and appropriate that the establishment of international relations with the government of Cuba should coincide with its inauguration, as well to provide a channel for the conduct of diplomatic relations with the new State as to open the path for the immediate negotiation of conventional agreements to carry out the provisions of the act above quoted. It is also advisable that consular representation be established without delay at the principal Cuban ports in order that commerce with the island may be conducted with due regard to the formalities prescribed by the revenue and navigation statutes of the United States, and that American citizens in Cuba may have the customary local resorts open to them for their business needs and, the case arising, for the protection of their rights.

I therefore recommend that provision be forthwith made and the salaries appropriated, to be immediately available, for:

A — Envoy Extraordinary and Minister Plenipotentiary to the Republic of Cuba, $10,000.
B — Secretary of the Legation, $2,000.
C — Second Secretary of the Legation, $1,500.
D — Consul General at Havana, $5,000.
E — Consuls: At Cienfuegos, $3,000; Santiago de Cuba, $3,000.

I do not recommend the present restoration of the consulates formerly maintained at Baracoa, Cardenas, Matanzas, Nuevitas, Sagua la Grande, and San Juan de los Remedios. The commercial interests at those posts heretofore have not been large. The consular fees collected there during the fiscal year 1896-1897 aggregated $752.10. It is believed that the actual needs of the six offices named can be efficiently subserved by agents under the three principal consular offices, till events may show the necessity of creating a full consulate at any point. The commercial and political conditions in the Island of Cuba while under the Spanish crown afford little basis for estimating the local development of intercourse with this country under the influence of the new relations which have been created by the achievement of Cuban independence, and which are to be broadened and strengthened in every proper way by conventional pacts with the Cubans and by wise and beneficient legislation aiming to stimulate the commerce between the two countries, if the great task we accepted in 1898 is to be fittingly accomplished.

(Signed) THEODORE ROOSEVELT.
White House, Washington, March 27, 1902.

Spanish Broom, a plant of the genus *Spartium*, the *S. junceum*, allied to the common broom, but of more rush-like growth. It has been cultivated in British gardens for upward of 300 years, bearing handsome yellow flowers. A good fiber is obtained from the macerated twigs, which is made into thread, cord, and a coarse sort of cloth, in some of the Mediterranean countries.

Spanish Brown, a species of earth used in painting, having a dark reddish brown color, which depends on the sesquioxide of iron.

Spanish Elm, *Cordia gerasacanthus,* an evergreen tree of Mexico and the West Indies, yielding a tough elastic wood of a fine grain.

Spanish Era, in chronology, an era founded on the Julian calendar, beginning Jan. 1, 38 B. C. It was current in Spain, Portugal, the S. of France, and the N. of Africa.

Spanish Fowls, a breed of domestic poultry of Mediterranean origin; tall, with stately carriage; tarsi long; comb single, of great size, deeply serrated; wattles largely developed; ear-lobes and side of face white; plumage black, glossed with green. They are tender in constitution, the comb being often injured by frost.

Spanish Main (*i. e.,* main land), a name given to the N. coast of South America from the Orinoco to Darien, and to the shores of the former Central American provinces of Spain contiguous to the Caribbean Sea. The name, however, is often popularly applied to the Caribbean Sea itself, and in this sense occurs frequently in connection with the buccaneers. See BUCCANEER.

Spanish Peaks, a pair of isolated mountains forming prominent landmarks in Southern Colorado, near the Mexican border. The higher summit is 13,623 feet above sea-level. It is partly composed of volcanic rocks. The other mountain is 12,720 feet high.

Spanish White, originally a white earth from Spain, used in painting; at present, a pigment prepared from chalk which has been separated in an impalpable form by washing.

Spanker. a large fore-and-aft sail set upon the mizzen mast of a ship or barque, the top extended by a gaff, the foot by a boom. It is also called the mizzen.

Span Worm, a name frequently given in the United States to certain caterpillars of which the canker worm is an example.

Spar, in mineralogy, a term employed to include a great number of crystallized, earthy, and some metallic substances, which easily break into rhomboidal, cubical, or laminated fragments with polished surfaces, but without regard to the ingredients of which they are composed. Among miners the term spar is frequently used alone to express any bright crystalline substance.

Spar Deck, a nautical term somewhat loosely applied, though properly signifying a temporary deck, consisting of spars supported on beams, laid in any part of a vessel. It also means the quarterdeck, gangways, and forecastle of a deep-waisted vessel, and is applied to the upper entire deck of a double-decked vessel without an open waist.

Sparhawk, Frances Campbell, an American author; born in Amesbury, Mass., July 28, 1847. She wrote a large number of serial stories for the "Christian Union" and other papers, of which the most important is "Elizabeth: A Romance of Colonial Days." She is also the author of "A Lazy Man's Work" (1881); "Little Polly Blatchley" (1887); "Miss West's Class in Geography" (1887); "Oroqua" (1892); "A Wedding Tangle" (1893); "Senator Intrigue and Inspector Noseby" (1895); "Fettered" (1899).

Sparidæ, a family of acanthopterygious, teleostean fishes, of which the genus *Sparus* is the type. They somewhat resemble the perches in form, the body being generally of an ovate form and covered with large scales. The *Sparidæ* are mostly inhabitants of warm climates. They are edible, and some of them much esteemed. The sheep's head of the Atlantic coast of the United States is very highly prized; the scuppaug is from 8 to 12 inches long.

Sparks, Jared, an American historian; born in Willington, Conn., May 10, 1789; was graduated at Harvard College in 1815; studied theology; and was ordained in the Unitarian Church in Baltimore in 1819. He took part in the doctrinal controversy with orthodox theologians; was chosen chaplain of the National House of Representatives in 1821; edited the "Unitarian Miscellany and Christian Monitor" in 1821–1823; conducted the "North American Review" in 1824–1831; and was the originator and first editor of the "American Almanac and Repository of Useful Knowledge." He was Professor of Ancient and Modern History at Harvard in 1839–1849; president of the college in 1849–1863; and the author of a large number of sermons, biographical and historical works, theological papers, etc., most notably "The Library of American Biography" and "Correspondence of the American Revolution." He died in Cambridge, Mass., March 14, 1866.

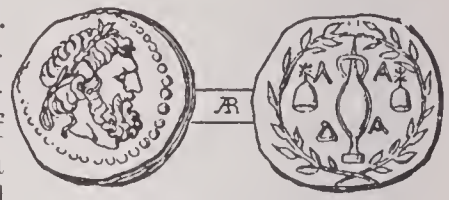
Sparrow, in ornithology, *Passer domesticus,* the house sparrow, a well known bird, the constant follower of civilized man. It ranges over Europe, into the N. of Africa and Asia, and has been introduced into America and Australia. Sparrows are found even in crowded cities and in manufacturing towns, these differing only from country birds in being dirtier, and, if possible, more daring. Mantle of male brown striped with black; head bluish-gray; two narrow bands, one white and the other rusty-yellow, on wings; cheeks grayish-white, front of neck black, underparts light-gray. From a high antiquity, their great fecundity, their attachment to

their young, their extreme pugnacity, and the large tolls they levy on the farmer and market gardener have been commented on by writers on ornithology, but opinions have long been divided on the subject of their alleged service to man in destroying insect pests. Farmers have, however, settled the question to their own satisfaction, and in many places a small sum is paid for the destruction of these birds, the legislatures of some of the States having made appropriations for this fund. J. H. Gurney in "The House Sparrow" conclusively shows that the sparrow's food, to the amount of 75 per cent., consists of grain, and only 10 per cent. of insects. The name sparrow is also loosely applied to several of the *Fringillidæ*.

Sparrow Hawk, in ornithology, the *Accipiter nisus*, extending across Europe, through Asia to Japan. The adult male is about 12 inches long, dark-brown on the upper surface, softening into gray as the bird grows old; the entire under surface is rusty-brown, with bands of a darker shade. The female is about 15 inches long, the upper surface nearly resembling that of the male bird in ground-color, but having many of the feathers white at the base; under surface grayish-white, with dark transverse bars. The sparrow hawk is very destructive to small quadrupeds and young birds. The hen lays four or five eggs irregularly blotched with brownish-crimson on a bluish-white ground. The name is also applied to the American falcon, the Australian collared sparrow hawk, the European kestrel, and the New Zealand quail hawk.

COMMON SPARROW HAWK.

Sparta, or **Lacedæmon,** a celebrated city of ancient Greece; capital of Laconia and of the Spartan State, and the chief city in the Peloponnesus; on the W. bank of the Eurotas river, and embraced a circuit of 6 miles. Sparta was a scattered city consisting of five separate quarters. Unlike Athens it was plainly built, and had few notable public buildings; consequently there are no imposing ruins to be seen here as in Athens, and the modern Sparta is only a village of some 4,000 inhabitants. Laconia, the district in which Sparta was situated, was the S. E. division of the Peloponnesus, bounded on the W. by Messenia, from which it was separated by the chain of Taygetus, on the N. by Arcadia and Argolis, and on the E. and S. by the sea. The Eurotas (Vasilopotamo, "king of rivers") here flows through a picturesque valley and empties into the Gulf of Laconia.



COIN OF SPARTA.

The Spartan State was founded, according to tradition, by Lacedæmon, son of Zeus. The most celebrated of its legendary kings was Menelaus. It is said to have been conquered by the Heraclidæ from N. Greece about 1080, who established a dyarchy or double dynasty of two kings in Sparta. Apart from this legend it is accepted as a historical fact that the Spartans were the descendants of the Dorians who invaded the Peloponnesus about that period, and that from an early period they followed a set of rigorous laws which they ascribed to Lycurgus. Shortly after their settlement in the Peloponnesus it is probable that the Spartans extended their sway over all the territory of Laconia, a portion of the inhabitants of which they reduced to the condition of slaves. They also waged war with the Messenians, the Arcadians, and the Argives, against whom they were so successful that before the close of the 6th century B. C. they were recognized as the leading people in all Greece.

Early in the following century began the Persian wars, in which a rivalry grew up between Athens and Sparta. This rivalry led to the Peloponnesian war, in which Athens was humiliated and the old ascendency of Sparta regained. (See GREECE). Soon after this the Spartans became involved in a war with Persia, and Athens, Thebes, Corinth, and some of the Peloponnesian States took this opportunity to declare war against them. This war, known as the Bœotian or Corinthian war, lasted eight years and increased the reputation and power of Athens. To break the alliance of Athens with Persia, Sparta, in 387 B. C., concluded with the latter power the peace

known by the name of Antalcidas; and the designs of Sparta became apparent when she occupied, without provocation, the city of Thebes, and introduced an aristocratical constitution there. Pelopidas delivered Thebes, and the celebrated Theban war (378–363) followed, in which Sparta was much enfeebled. During the following century Sparta steadily declined, though one or two isolated attempts were made to restore its former greatness. The principal of these was made by Cleomenes (236–222), but his endeavors failed, because there were then scarcely 700 of Spartan descent, and the majority of these were in a state of beggary. With the rest of Greece Sparta latterly passed under the dominion of the Romans in 146 B. C.

The Spartans differed from the other Greeks in manners, customs, and constitution. Their kings (two of whom always reigned at once) ruled only through the popular will, acting as umpires in disputes, and commanding the army. The Spartans proper, that is, the descendants of the Dorians, occupying themselves with war and the chase, left all ordinary labor to the Helots (slaves), while the class known as Periœci (descendants of the ancient inhabitants of the country) engaged in commerce, navigation, and manufactures. The distinguishing traits of the Spartans were severity, resolution, and perseverance, but they were also accounted faithless and crafty. When a child was born, if it proved vigorous and sound the State received it into the number of citizens, otherwise it was thrown into a cave on Mount Taygetus. To accustom the children to endure hunger they gave them but little food; if they stood in need of more they were obliged to steal it; and if discovered they were severely punished. They wore no outer garment except in bad weather, no shoes at any time, and they were obliged to make their beds of rushes from the Eurotas. The principal object of attention during the periods of boyhood and youth was physical education, which consisted in running, leaping, throwing the discus, wrestling, boxing, the chase, etc. A singular custom was the flogging of boys on the annual festival of Artemis Orthia, for the purpose of inuring them to bear pain with firmness. Whoever uttered the least cry during the scourging, which was so severe as to sometimes prove fatal, was considered as disgraced, while he who bore it without shrinking was crowned. The Spartans were the only people of Greece who avowedly despised learning and excluded it from the education of youth. The education of the Spartan females was also different from that of the Greeks elsewhere. Instead of remaining at home, as in Athens, spinning, they danced in public, wrestled with each other, ran on the course, threw the discus, etc.

Spartacus, the leader of the Roman slaves in the great revolt which broke out about 73 B. C.; a Thracian by birth, who from a shepherd became a leader of a band of robbers when he was captured and sold to a trainer of gladiators at Capua. On the murder of his father by the Romans he had made an oath to wage war against Rome; and he formed a conspiracy to escape, and, when it was discovered, broke out with some 70 followers, with whom he made for the crater of Vesuvius, where hordes of runaway slaves soon joined him. He first overpowered and seized the arms of a force sent against him from Capua,

OATH OF SPARTACUS: STATUE BY BARRIAS.

next routed an army of 3,000 men under C. Clodius, and so passed from victory to victory, overrunning Southern Italy and sacking many of the cities of Campania, his numbers growing to 100,000 men. Spartacus, who failed to get support from the Italian communities, and from the first knew the real weakness of his position, strove to persuade his victorious bands to march N. to the Alps and disperse to their native regions; but they were intoxicated with victory, and saw glittering before their eyes all the plunder of Italy. Against his better judgment he continued the war, showing himself a consummate captain in the

strategy and valor with which he routed one Roman consular army after another, and the policy by which for long he assuaged the jealousies and dissensions among his followers. At length in 71 M. Licinius Crassus received the command, and after some time of cautious delay forced Spartacus into the narrow peninsula of Rhegium, from which, however, he burst out through the Roman lines with a portion of his force. Crassus urged the Senate to recall Lucullus from Asia and Pompey from Spain, but meantime he himself pursued active hostilities against the dreaded enemy. Spartacus finding all hope at an end made a dash on Brundusium, hoping to seize the shipping and get across the Adriatic, but was foiled by the presence of Lucullus, whereupon he fell back on the river Silarus, and there made a heroic stand against Crassus till he was cut down.

Spartanburg, a city and county-seat of Spartanburg co., S. C.; on the Glenn Springs, the Charleston and West Carolina, and the Southern railroads; 98 miles N. of Columbia. Here are Wofford College (M. E., S.), Converse College for Women, Kennedy Public Library, street railroad and electric light plants, National and State banks, and daily and weekly newspapers. It has cotton mills, limestone quarries, and gold and iron mines. Pop. (1890) 5,544; (1900) 11,395; (1910) 17,517.

Sparteine, an alkaloid discovered by Dr. Stenhouse in 1851, in *Spartium scoparium*; symbol, $C_{15}H_{26}N_2$. It is a thick, colorless, transparent oil, heavier than water, and possesses a peculiar, unpleasant odor and a very bitter taste. It boils at 288°, is strongly alkaline, sparingly soluble in water, very poisonous, and resembles nicotine in its compounds. Like the latter it is a nitrile base.

Spartel, Cape, a promontory at the entrance to the Straits of Gibraltar, and about 1,000 feet above the sea.

Spartina, in botany, the cord grass; a genus of grasses, tribe Chloreæ. Spikes two or more, unilateral, empty glumes two. Known species eight, chiefly from warm countries. One, *Spartina stricta,* the twin-spiked cord-grass, is European, being found in muddy salt marshes. There are two subspecies, *S. stricta* proper and *S. alternifolia.*

Spartium (t as sh), in botany, a genus of *Cytiseæ.* Shrubs thickly set with brush-like verdant branches, very ornamental, and in summer covered with white or yellow papilionaceous flowers. *S. junceum* is the Spanish broom. In France and Spain a thread made from its fibers is twisted into cordage, or sometimes even woven into cloth. It is used also as a green food. Its flowers are very attractive to bees. *S. monospermum,* which has snow-white flowers, grows on sand dunes in Spain, Barbary, Arabia, etc., binding them together. Its twigs are used for tying bundles and as a food for goats.

Spar Torpedo, a torpedo carried on the end of a spar rigged overboard from the bows of a vessel and fired either by contact or electricity.

Spasms, irregular and violent contractions of the muscular structures, but less violent than convulsions. Spasms are always involuntary, even when the voluntary muscles are concerned. There are two varieties of spasms, called tonic and clonic. Tonic spasms, or spastic contractions, consist in contractions attended with rigidity or hardness of the muscles, as in common cramps and tetanus. Clonic spasms consist in rapidly alternating contraction and relaxation, as in chorea, epilepsy, and convulsive hysteria. Spasms constitute the more important symptoms in several diseases, as in spasmodic croup and certain forms of retention of urine. Medicines which are prescribed to allay irregular and inordinate muscular contractions or spasms, called antispasmodics, are the following: Hydrocyanic acid, ether, ammonia, assafœtida, belladonna, cajuput, camphor, cannabis indica, castoreum, chloral hydrate, chloroform, conium, galbanum, hyoscyamus, lobelia, moschus, oils of peppermint and ruta, stramonium, sumbul, turpentine, valerian, and oxide of zinc.

Spasmodic School, a name applied to a group of English poets about the middle of the 19th century, among whom were Philip James Bailey, Sydney Dobell, and Alexander Smith. The name implied an overstrained and unnatural method of sentiment and expression, which sometimes grew out of sheer affectation and not seldom sank hopelessly into bathos.

Spatangidæ, in zoölogy, a family of *Echinoidea,* with several genera. Test oval, oblong, or heart-shaped; ambulacra petaloid, the anterior one unpaired; anus posterior; mouth inferior. Bands of microscopic tubercles known as fascioles, are generally present, differently placed in different genera. They commence in the Chalk formation.

Spathe, or **Spatha,** in botany, a large bract or floral leaf enveloping the immature inflorescence of some monocotyledons, and so guarding it from injury. The enclosed inflorescence often consists of an axis bearing numerous closely-packed sessile flowers, arranged in a spike-like manner — this is termed a spadix. The genus *Arum* offers a good example of spathe and spadix. In palms the spadix is frequently branched, the branches being subtended by secondary spathes.

Spathiopyrite, a mineral occurring in rounded crystals with angles near those of leucopyrite; crystallization, orthorhombic; hardness, 4.5; sp. gr., 6.7; color, tin-white when broken, but rapidly tarnishing to a dark steel-gray. An analysis yielded: Arsenic, 61.46; sulphur, 2.37; cobalt, 14.97; calcium, 4.22; iron, 16.47. Found at Bieber, Hesse.

Spatula, a knife, with a broad, thin, flexible blade, used by druggists, color compounders, painters, etc., for spreading plasters and working pigments. In surgery, a flat instrument, angular or straight, for depressing the tongue. In ornithology, a genus of *Anatidæ*, with five species: One (*S. clypeata*), the shoveler, peculiar to the Northern Hemisphere, and four peculiar respectively to Australia, New Zealand, South Africa and South America. Bill much longer than head, compressed at base, widening at end, lamellæ projecting conspicuously from base to near broadest part; tail short, graduated, of 14 pointed feathers; legs very short, hind toe small, free, unlobed.

Spatularia, or **Polyodon,** a genus of fishes belonging to the sturgeon tribe. They are remarkable for the form of their snouts, which are enormously long and leaf-like in form. The type of the genus is the paddle fish of the Mississippi.

Spatule, in ornithology, a broadening of the vanes at the end of the rectrices in some birds, usually separated from the rest of the vanes by a bare portion of the stem. In many of the motmots spatules are formed by the denudation of the stem of the tail feathers by the bird.

Spaulding, Solomon, an American clergyman and writer; born in Ashford, Conn., in 1761. He was a Revolutionary soldier, a Congregational minister, and afterward a manufacturer of iron. While living at Conneaut, Pa. (1811–1812), he wrote a romance, "The Manuscript Found," published in 1812, purporting to have been discovered in an ancient mound. This work was said to have furnished the basis for the "Book of Mormon"; in denial of which the original manuscript of Spaulding's romance was republished by the Mormons in 1885. (See Book of Mormon.) He died in Amity, Pa., Oct. 20, 1816.

Spavin, a disease of horses which occurs under two different forms, both interfering with soundness. In young, weakly, or overworked subjects the hock-joint is sometimes distended with dark-colored thickened synovia or joint oil. This is bog spavin. Fomentations, occasional friction, a laxative diet, and rest should be diligently tried; and if such remedies prove unsuccessful the swelling must be dressed with strong blistering ointment or fired. The second variety of spavin is the more common. Toward the inside of the hock, at the head of the shank bones, or between some of the small bones of the hock, a bony enlargement may be seen and felt. This is bone spavin. At first there is tenderness, heat, swelling, and considerable lameness; but as the inflammation in the bone and its investing membrane abates the lameness may entirely disappear, or a slight stiffness may remain. In recent and slight cases cold water should be applied continuously; but in serious cases, when the part is swollen and tender, hot fomentations are best. For several days they must be perseveringly employed. When the part is again cool and free from pain an iodide of mercury or fly blister should be applied, and the animal treated to three months' rest in a small paddock, the end of a barn, or a roomy box stall. In persistent cases firing or setoning usually gives much relief.

Spawn, the eggs or ova of fishes, frogs, etc., from which, when fertilized by the males, a new progeny arises that continues the species. In the oviparous fishes with distinct sexes the eggs are impregnated externally, and arrive at maturity without the aid of the mother. The spawn being deposited by the female, the male then pours on it the impregnating fluid. In the ovoviviparous fishes sexual intercourse takes place, and the eggs are hatched in the uterus. Fishes exhibit a great variety in regard to the number of their eggs. In the spawn of a codfish, for example, no fewer than 3,500,000 eggs have been found. In general, before spawning, fish forsake the deep water and approach the shore, and some fish leave the salt water and ascend the rivers before spawning, and then return again. See Pisciculture.

Speaker, in politics, one who presides over a deliberative assembly, preserving order and regulating the debates; as, the Speaker of the House of Representatives; the Speaker of the House of Lords or Commons, etc. The Speaker of the House of Representatives is chosen by ballot from among the members upon the assembling of Congress, and occupies that office till the expiration of the body by adjournment *sine die*. If an extra session be called there is no new election of speaker, the same officer presiding over the deliberations. The presiding officer in the Senate is styled the President of the Senate, and he is not elected by that body, the office being held *ex officio* by the Vice-President of the United States.

Speaking Trumpet, an instrument for enabling the sound of the human voice to be conveyed to a greater distance. It is of the utmost use on shipboard in enabling the officers to convey orders during windy weather from one part of the deck to another, or to the rigging. The invention is ascribed to Sir Samuel Morland in 1670,

though Athanasius Kircher laid claim to it. Morland's trumpet was of the same form as that now in use — viz., a truncated cone, with an outward curve or lip at the opening. The theory of the action of this instrument is much the same as that of the sounding board of a musical instrument, but the sounding board is aërial instead of solid. The air immediately in front of the instrument is acted on over so wide a surface that it cannot effectively evade compression and rarefaction by any process of overflow and inflow toward the sides, and the result is as if the air were well laid hold of and firmly set in vibration. The most recent improvement of the speaking-trumpet is known as the megaphone.

Spear, a weapon of offense, consisting of a wooden shaft or pole varying in length up to eight or nine feet, and provided with a sharp piercing point. The spear may be regarded as the prototype of the various forms of piercing weapons, such as the arrow, bolt, and dart, which are projected from bows, catapults, or other engines, and the javelin, assegai, and lance, held in or thrown by the hand. The longer and heavier spears and lances are mainly retained in the hand while in use, but there is no absolute distinction, and the throwing of a spear has in all ages been a form of offensive warfare. There can be no doubt that a weapon such as the spear is the most ancient as well as the most universal of warlike and hunting weapons.

In its earliest form the spear would naturally consist of a simple pole of tough wood sharpened to a point at one extremity, which point might be both formed and hardened by charring in fire. From this an improvement would consist in fitting to the shaft a separate spear head of bone, as is still practised among primitive races. No trace of these early spears remains to us, but of the more developed forms having heads of chipped flint or other hard stones examples are plentiful, and most ingenious methods of fixing such heads are yet practised by South Sea tribes, who carve, paint, and otherwise ornament their spears in an elaborate manner. To flint heads succeeded heads of bronze, but these came only late in the bronze period, and were still in use when the Homeric poems were composed. The bronze spear heads found in Great Britain and in Northern Europe generally were cast with sockets, into which the end of the shaft was inserted, but on the Eastern Mediterranean coasts tanged spear heads were used. These spear heads were various in form and size, some being three-edged like the old bayonets, others were expanded leaf-shaped blades, some barbed, and some having loopholes either in socket or blade by which they were lashed to the shaft.

The war lance of the mediæval knights was 16 feet long; the weapon of modern cavalry regiments known as lancers may be from 8½ to 11 feet long, usually adorned with a small flag near the head. The Persians at the present day forge spear heads, for ornamental purposes only, with two and sometimes three prongs. The modern spears of savage tribes, used equally for hunting and for warlike purposes, are frequently barbed with fish and other bones, and their fighting spears have sometimes poisoned tips. Among the South Sea Islanders a fishing spear having several slender barbed points is an important weapon. Among civilized communities the hunting spear continues to be used for following the wild boar and other large game.

Spear, James, an American manufacturer; born in Mauch Chunk, Pa., Feb. 17, 1827; removed to Philadelphia in 1848, and engaged in the manufacture of stoves. He made the first successful car-heater, and invented a number of familiar devices, the principal one being the anti-clinker grate, which is now in general use.. He took an active interest in the Blind Men's Home, was one of the incorporators of the Hayes Mechanics' Home, and aided many institutions, especially the University of Pennsylvania. He died in Wallingford, Pa., Jan. 30, 1902.

Spearmint, or **Spiremint,** in botany, a mint, *Mentha viridis*, with oblong, lanceolate, sub-acute, serrate leaves, and slender spikes of flowers. Found in watery places. It is used in cookery as a sauce, and yields an aromatic and carminative oil, oil of spearmint.

Spears, John Randolph, an American author; born in Ohio in 1850. He published "The Gold Diggings of Cape Horn"; "The Port of Missing Ships, and Other Stories" "The History of our Navy"; "Our Navy in the War With Spain"; "History of the American Slave Trade," etc.

Spear Thistle, a common thistle, the *Cirsium lanceolatum*. It grows on waysides and in pastures. The leaves are downy beneath, and their points long and very sharp, and it has handsome heads of purple flowers.

Spearwort, a plant of the genus *Ranunculus*. The great spearwort is the *R. Lingua*, and the lesser spearwort is the *R. flammula*. The latter is an American plant, with lanceolate undivided leaves and yellow flowers, growing in wet localities.

Species, in biology, a somewhat ambiguous term used to denote a limited group of organisms. resembling each other, and capable of reproducing similar organisms, animal or vegetable, as the case may be. A species is defined by Haeckel as "the sum of all cycles of reproduction which, under

similar conditions of existence, exhibit similar forms." Linnæus held that all species were the direct descendants from and had the characters of primevally created forms, and in this he was followed by those who accepted the first chapter of Genesis in a strictly literal sense. Buffon and Cuvier, leaving the question of origin on one side, held the distinguishing marks of a species to be similarity and capability of reproduction. But besides varieties and races in various species of animals and plants, dimorphism, and in others trimorphism, exists, so that close similarity cannot be taken as a criterion, and the value attached to external resemblances varies in the case of different observers. At a later date was added the physiological definition that all the individuals of every species were capable of producing fertile offspring by intercrossing, whereas sexual intercourse between different species produced only sterile offspring or was actually infertile; and, though subject to exceptions, this definition is generally true. The descent of any given series of individuals from a single pair, or from pairs exactly similar to each other, is in no case capable of proof.

Darwin in his "Origin of Species" says: "I look at the term species as one arbitrarily given for the sake of convenience to a set of individuals closely resembling each other, and that it does not essentially differ from the term variety, which is given to less distinct and more fluctuating forms" (see DARWINISM). That book popularized in England the idea of the mutability of species, the chief factor in which Darwin believed to be Natural Selection, though he afterward modified his views to some extent as to its importance. The latest theory of the origin of species is that of Physiological Selection, propounded by W. G. J. Romanes, F. R. S., who holds that many species have arisen on account of variations in the reproductive system, leading to some infertility with parent forms — mutual sterility being thus regarded as one of the conditions, and not as one of the consequences of specific differentiation.

In logic, a predicable that expresses the whole essence of its subject in so far as any common term can express it. The names species and genus are merely relative, and the same common term may in one case be the species which is predicated of an individual, and in another case the individual of which a species is predicated. Thus the individual, George, belongs to the logical species man, while man is an individual of the logical species animal.

Specific Gravity. See GRAVITY, SPECIFIC.

Specific Heat, a term applied to the quantity of heat required to raise equal weights of different substances through equal intervals of temperature. Water is taken as the standard substance in measuring quantities of heat. The thermal capacity of the unit mass of cold water is unity; and the number which denotes the thermal capacity of a body expresses the mass of water which has the same thermal capacity as the body. Thus the thermal capacity of the unit mass of a substance is called its specific heat, and is identical with the ratio of the thermal capacity of any mass of the substance to that of an equal mass of water. The specific heats of the metals and of many other substances have been carefully determined, and are tabulated in all the larger books on heat.

Specific Name, the scientific name by which one species is distinguished from another. Linnæus introduced the binomial system of nomenclature, in which the first word is the generic and the second the specific name. Thus the lion and the wild cat both belong to the genus *Felis*, but the specific name of the first is *leo*, and of the second *catus*; the potato and the egg plant both belong to the genus *Solanum*, but the specific name of the first is *tuberosum*, and of the second *esculentum*. In the trinomial system, sometimes adopted owing to the difficulty of distinguishing between varieties and species, the second name is specific and the third varietal; as, *Sciurus* (indicating the genus) *caniceps* (the species) *pygerythrus* (the variety).

Spectacle, in the plural, a familiar and invaluable optical instrument used to assist or correct defects of vision. They are frequently also called eye glasses, though properly this term is applied to spectacles which are merely fixed on the nose. Spectacles consist of two oval or circular lenses mounted in a light metal frame, composed of the bows, bridge, and sides or temples. The frame is so constructed as to rest on and adhere to the nose and temples and keep the lenses in their proper position. There are also tinted, gray, or smoke gray spectacles to protect sensitive eyes from too much light. Mere weakness of the eyes is not benefited by spectacles, unless by the protective kind. Wire gauze spectacles are used to exclude dust and ashes. Divided spectacles have each lens composed of two semicircles of different foci neatly united; one half for looking at distant objects, the other for examining things near the eye. See EYE: SIGHT.

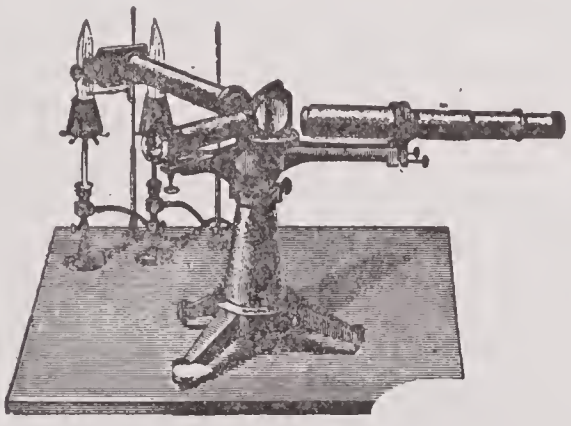
Spectacled Bear (*Tremarctos ornatus*), the sole representative of the bears in South America, inhabiting the high mountain forests of Chile and Peru. So called from the light colored rings round the eyes having exactly the appearance of a pair of spectacles; the rest of the face and body being black.

Spectre Bats (*Phyllostomidæ*), a family of insectivorous *Cheiroptera*, which have a simple and fleshy leaf-like appendage to the nose, and a fore finger of two joints. They attain a considerable size, and the family comprises the vampire bats.

Spectro Bolometer, a combination of a spectroscope and BOLOMETER (*q. v.*), first employed by Langley in investigating the total amount of energy in the different parts of the spectrum of any source of radiant energy, and in searching out feeble radiations of a wave length hitherto unknown, and by some declared to be impossible. The sensitive bolometer is attached to the spectroscope in the place of the eye piece, and with its sensitive galvanometer as an indicator it marks the changing intensity of the radiant energy as it is moved along the range of the spectrum. With this instrument Langley measured the energy of the different parts of the spectrum of melting ice as it radiated its heat to the outside cold of the winter air.

Spectrometer, in optics, a word used in somewhat different though allied senses. It has been applied to a micrometer or other apparatus applied to the eye piece of a spectroscope for measuring the position of the lines. But it is now very generally used as a substitute for spectroscope, the word being applied to that better class of instruments which are fitted up for measuring and determining with great exactness the position of the lines in the spectra examined and the qualities of prisms as regards refractive and dispersive power.

Spectroscope, an instrument for observing spectra, or for spectrum analysis. With a single glass prism, the few most prominent lines in a solar spectrum may be seen by using a narrow slit to admit the light, which was the first great improvement made upon Newton's experiment, since a hole or wide slit gives confusion of effect. The second great improvement was to place a collimating lens behind the slit at its focal distance, whereby all the rays from the slit became a parallel bundle before passing through the prism. Finally a small telescope was mounted behind the prism to magnify and define the image thus obtained. The whole arranged on a table, with means of adjusting the collimating and eye tubes at the proper angles with the prism, forms the ordinary single-prism spectroscope. Further prisms may be added to increase the dispersion, and as many as 11 have been used, but it is more usual to employ half the total number, and having sent the rays once through their lower portion, to reflect them back again through the upper ends, thus using each prism twice. Arrangements are often added for throwing the image of a micrometer scale upon the spectrum (see SPECTROMETER), or a reflecting prism may be placed over half of the slit to reflect the solar spectrum into the instrument for comparison with the one under observation. It is in this way that spectra are compared with the solar lines, which are carefully mapped and form the standard of reference. By combining prisms of the different refractive and dispersive powers, a strong spectrum may be obtained without deflection. Such prisms may be contained in quite a small tube with slit and lens, and are called direct-vision spectroscopes, which are much used for microscopic observation. Instruments specially fitted for the purpose are called star spectroscopes, and there are also special sun spectroscopes, such being necessarily different in practical details from ordinary or chemical spectroscopes. Of late years it has become very usual to employ the spectra from diffraction gratings instead of prisms. The higher order spectra thus produced are very pure, and have the advantage of giving the lines in the true position due to their relative wave lengths alone, while prisms compress some groups of lines and extend others, according to the peculiar dispersion of the glass. Spectroscopes thus constructed are called grating spectroscopes.



A SPECTROSCOPE.

One of the largest spectroscopes in the world was completed in 1899 by Prof. John A. Brashear, an astronomer of Allegheny, Pa., for Dr. Hans Hauswaldt, a scientist of Magdeburg, Germany. This powerful concave grating instrument is 21 feet long and requires a room about 25 feet square in which to operate it. The grating used on the spectroscope has a six-inch aperture and is ruled with 110,000 lines. So accurately are these lines ruled that none of them varies more than $\frac{3}{1\,0\,0\,0\,0\,0\,0}$ of an inch from the correct position; and so powerful is the instrument that whereas an ordinary spectroscope would show from 100 to 200 lines belonging to the spectrum of iron, this apparatus will reveal more than 2,000.

During the total eclipse of the sun in January, 1898, which was observed by many scientists who visited India for that pur-

pose, some rare photographs were taken by means of spectroscopes arranged and operated by Prof. J. Evershed, F. R. A. S.

Spectrum, in optics, the colored image or images produced when the rays from any source of light are decomposed or dispersed by refraction through a prism. It has been proved that whiteness is simply a totality of effect produced by the simultaneous effects of many colors falling at once upon the retina. It has been shown (see REFRACTION) how a beam of light is deflected on meeting at any inclination the surface of a denser medium, and it is obvious that by using a prism with two inclined surfaces, the beam may be permanently deflected. It is found that each different color, representing a different length of wave, is differently refracted by the prism, or has its own special index of refraction; hence the prism separates or spreads out, in order, according to their refrangibility, all the different colors of which the beam is composed. This appearance is the spectrum of that particular light. Solids or liquids heated to incandescence — as the particles of soot in a candle flame — always yield an unbroken band of colors shading into one another; this is called a continuous spectrum. Incandescent gases generally yield lines or bands only, and this is a line or banded spectrum. When portions of what would have been a continuous spectrum are intercepted or cut out by an intervening medium this is called an absorption spectrum. Besides the waves of such a length as cause visual effects, there are many more beyond the red at one end of the spectrum and the violet at the other, which produce powerful chemical and heating effects. This portion is sometimes called the invisible spectrum, sometimes described as the ultra-red or ultra-violet spectrum. Its length greatly exceeds that of the visible spectrum, and it is found to comprise lines and bands precisely analogous to those occurring in the luminous portion.

Spectrum Analysis, in physics and chemistry, the determination of the chemical composition, the physical condition, or both, of any body by the spectrum of the light which it emits or suffers to pass through it, under certain conditions. For such determinations an instrument is used called the SPECTROSCOPE (*q. v.*), which employs the light passing through a very narrow slit, and, by using more prisms than one, disperses or separates the colors a great deal more than one prism alone can do. The human eye is totally unable to judge of the real component colors of any light presented to it; not only does a mixture of all colors appear white, but so do many simple pairs of colors; and similarly two apparently similar shades of color may be quite differently constituted, the one being perhaps a pure color, while the other is really a compound. The prism never errs, but rigidly sorts out any light presented to it under all the separate wave lengths of which it is composed, each one having its own invariable place in the spectrum of a beam of ideal white light.

A vast mass of commercial spectrum analysis consists of the study of simple absorption spectra. Most of the color we see around us is really of the nature of a shadow; the colored body absorbs among its molecules many of the constituent rays of the white light which falls on it, and the color we see consists of the remainder. It is the same with colored transparent bodies; a red glass does not turn all the light into red, but simply stops or absorbs all the rays except those which make up the red. This is shown by spectrum analysis of the light which has passed through any such body or been reflected from it; various dark bands are cut out of the white-light spectrum. If glass cells are filled with various colored fluids, and interposed between the slit of the spectroscope and some source of light which gives a complete continuous spectrum, the various bands cut out are observed. These bands are invariable for the same substance, in the same state — *i. e.*, of dilution or otherwise — and hence we have an anaylsis which is very powerful as regards adulteration. Thus, an alcoholic solution with a decoction of logwood, etc., can be made up so as to precisely imitate to the eye the color of port wine. But the spectroscope cannot be so cheated; the spectrum of port wine cannot be imitated by anything else; though the visual total may appear the same, the prism will sort out the imitation with different constituents. It has been found that up to a certain age even the year of the vintage can be thus determined. So, again, healthy blood gives a quite different absorption spectrum from blood poisoned by carbonic oxide. The prism is thus used daily to test the validity of many commercial products. It should be observed that numerous apparently clear and colorless substances show very strong absorption bands, *e. g.*, solutions of didymium.

Analysis of the rays emitted by luminous bodies throws light on both their chemical constitution and physical condition. A solid or liquid substance heated to a high temperature gives a continuous spectrum. It first becomes red, representing the slowest vibrations as taken up by its molecules. Gradually the yellow, green, and, finally, blue rays are added as quicker and more energetic vibrations are imparted, till it becomes a white or even bluish color, but the spectrum is always continuous so far as it goes. Therefore a continuous spectrum is presumptive proof of the body

being in a solid or liquid state. On the other hand, every substance heated sufficiently to become luminous, as gas or vapor, when at a low pressure, gives a spectrum of bright lines or bands only. It is this localization which causes the color of the flame; and the spectrum of each of the known elements is so well recognized that new lines are proofs of the presence of some unknown chemical element, several of which have been discovered in this manner. Thus the spectrum of the vapor of a substance, when ignited in the electric arc or in a vacuum tube, is another searching method of chemical analysis. It is found, however, that as the density is increased the lines in the spectrum of a luminous gas are widened or thickened. Gradually these widened bands approach each other, till at a great pressure the spectrum becomes continuous. This is intelligible on the hypothesis that in rarified gases the molecules are free to give their own peculiar periods of vibration, but that as they are crowded together they are hampered, and the vibrations and encounters modified into other periods, till at last the complex vibrations of a solid are produced, and give the complete or continuous spectrum. Thus the nature of the spectrum — say of a gaseous nebula — gives us information not only of the composition, but of the physical condition of the gas.

Another wide department of research was opened by the study of the spectrum of the sun. To Newton this appeared continuous; but when it was made pure by more dispersion and the use of a slit, it was found to be crossed by countless dark lines, thousands of which have been mapped. On the face of it these appeared to show absorption of some kind; while the foundation or continuous spectrum must be due to either incandescent solid, liquid, or at least very dense gaseous matter. It was soon discovered that two of the most distinct dark lines (called D lines) across the yellow portion were exactly coincident with the two bright yellow lines given by incandescent sodium vapor; and Professor Stokes, in 1852, pointed out the probable cause of this, in the molecules taking up or absorbing all vibrations of their own peculiar period which reach them, just as a tuning fork will respond to its own note sung to it. Kirchhoff verified this, proving experimentally that sodium flame interposed before the slit of a bright solar spectrum darkened the D lines. Most of the other dark lines of the solar spectrum were afterward identified with the bright lines of the vapors of various elements; and thus was proved the fact that the incandescent photosphere of the sun is surrounded by a highly heated, but still by comparison cooler, atmosphere containing hydrogen, sodium, iron, and

Spectrum Analysis

many other substances. Subsequently, by suitable arrangements, the bright lines of this external atmosphere were obtained at the edge of the sun's disk. The chemistry and condition of the stars were rapidly studied in the same way, with the result of discovering very interesting resemblances, and in many cases still more interesting and marked differences between their condition and that of the sun. In this way, for instance, when a great increase in the brilliancy of the variable star Tau Coronæ was observed in May, 1886, the spectroscope showed its usual absorption spectrum to be crossed by a few bright lines, and thus the phenomenon was clearly traced to some almost inconceivable outburst of glowing hydrogen, as was also the "new star" which appeared in Cygnus in 1876. In another star there is an abundant quantity of the metal tellurium, which cannot be traced in our sun, and is only present in exceedingly small quantities in our earth.

Still further; the apparent color or wave length of any given ray apparently depends simply on the rate at which the ethereal waves beat upon the retina. If the source of light be approaching rapidly enough, this rate will obviously be increased, the effect of which will be to make that ray of apparently higher refrangibility, or nearer a blue color. In sound we get exactly the same effect, if a whistle sounds while two trains are approaching; the pitch rises till the whistle is opposite a hearer in the other train, and then as rapidly falls as it recedes. Now it is found that well-known groups of lines are thus shifted in the case of certain stars; and thus it is absolutely determined that they are approaching or receding from the solar system at the rate of so many miles per second. In exactly the same way the speed of up-rushes and down-rushes of the glowing hydrogen during solar storms has been determined.

Spectrum analysis has finally led to a theory or speculation of capital importance, concerning the so-called "elements." The spectra of compounds are as characteristic as those of what are called elements; but as the temperature of the luminous vapor is increased, this spectrum breaks up, as it were, into the lines of the elements themselves. Where the vapor is known to be "dissociated," as it is termed, at a certain temperature, there is simultaneously a marked and sudden change in its spectrum. Now it is found that even at temperatures produced in our laboratories the spectra of the so-called elements themselves go through analogous changes as the temperature is raised, giving apparently similar reason to believe that they then break up into still simpler elements. In the far greater heat of the sun's chromosphere there is much more evidence of this process going on, and

there is one strong line in particular which has never been identified with any element known on earth. It further appears that unless we are to suppose an amount of impurity hardly possible, different elements are capable at certain high temperatures of giving rise to certain coincident lines; and from these and other collated facts, such as an ascertained relation between the atomic weight of an element and the position of its lines in the spectrum, it is now held to be probable that the so-called elements are themselves compounds, which at a certain temperature are broken up into much fewer elements, or possibly into one. This conclusion is one of the latest results of spectrum analysis. See PICKERING, EDWARD C.

Spectrum Photography, in astronomy, an application of photography that has already yielded very remarkable results, and promises to be one of the most important means of investigation in advancing our knowledge of stellar motions. Huggins used it some years ago in the determination of the velocity of motion to or from us of a limited number of stars, and at the Potsdam Observatory this work has been carried still further and with more accurate results. At the same observatory Vogel determined the orbital velocity to and from us of the variable star Algol, thus proving that its variations of light are caused by the intervention of an eclipsing satellite, and moreover that the mass of the latter is sufficient to swing the bright component in an orbit sufficiently large to show a measurable motion to and from us as they revolve round their common center of gravity.

Speculum, an instrument adapted for exploring the several channels and deeper seated parts of the human body. The chief of these are the ear, eye, nose, mouth, throat, rectum, vagina. For each of these there are specially adapted instruments. Also the concave mirror of a reflecting telescope. Though there is nothing in the name so limiting the meaning, it is generally understood today that the word refers to the old kind of mirrors which were made of polished metal, and the modern mirrors or reflectors are generally referred to, when it is desired to specify them, as "silver-on-glass" mirrors.

Speculum Metal, an alloy used for the specula or mirrors of reflecting telescopes. The best is composed of 126 parts of copper and 58.9 of tin. It takes a fine polish and is not easily tarnished unless exposed to damp. Glass with a film of metallic silver deposited on it is now taking the place of speculum metal for these mirrors. The silvered glass is equally serviceable and less costly. See TELESCOPE.

Spedding, James, an English historian; born near Bassenthwaite, Cumberland, in June, 1808. The labors of his whole life were concerned with the works of Lord Bacon; and his first work, "Evenings with a Reviewer" (2 vols., privately printed in 1848, published 1881), was an elaborate review of Macaulay's essay on the great philosopher. He published "The Works of Francis Bacon" (7 vols. 1857–1859); "Life and Letters of Francis Bacon" (7 vols. 1870–1876); "Life and Times of Francis Bacon" (2 vols. 1878); and a volume of miscellaneous "Reviews and Discussions" (1869). He died in London, March 9, 1881.

Speech, spoken language; uttered sounds intended to convey meaning, and produced by the organs of voice, namely, the larynx, and the mouth and its parts, including the tongue and teeth. In speech two great classes of sounds are produced, these being usually known as vowels and consonants. Vowels are pronounced by sounds coming primarily from the larynx and passing with comparative freedom through the mouth cavity, though modified in certain ways; while consonants are formed by sounds caused by the greater or less interruption of the current of air from the larynx in the mouth. Vowels can be uttered alone and independently of consonants, and their sounds can be prolonged at will; consonants have no importance in speech as apart from vowels, and are named consonants from being used along with vowels. Both vowel and consonant sounds are very numerous if we investigate the different languages of the world, but any one language only has a fraction of those that may be used. A single sound may convey an idea of itself and thus form a word, or several may be combined to form a word, and if the word is uttered by several distinct successive changes in position of the vocal organs it is a word of so many syllables. Words, again, are combined to form sentences or complete statements, and the aggregate of words used by any people or community in mutual intercourse forms its language. See PHILOLOGY: VOICE: VOWEL.

Speed, James, an American lawyer; born in Jefferson co., Ky., March 11, 1812; was graduated at St. Joseph's College in that State; commenced the practice of law in Louisville, and in 1847 was elected to the lower house of the Legislature, and in 1861 to the Senate. The outbreak of the Civil War found Judge Speed an uncompromising Union man, and he took charge of the recruiting stations in Kentucky. He was a brother of JOSHUA F. SPEED, the friend of Abraham Lincoln, and it was probably through this acquaintance with his brother that Lincoln came to select Speed for a place in his cabinet, though he had previously gained distinction as a lawyer and professor in the Law School of Transylvania University at Lexington. Speed was ap-

pointed Attorney-General in November, 1864, and was retained in the office by President Johnson after the assassination of Mr. Lincoln till July, 1866, when he resigned. He died June 25, 1887.

Speed, John, an English antiquary; born in Farrington, Cheshire, in 1542, and worked most of his days at London as a tailor. All his life long he had been acquiring historical learning, and his extraordinary attainments at length gained him the acquaintance of Sir Fulke Greville and others, and hence opened up a door for the publication of the great works through which his name survives. These are "Maps (54) of England and Wales" (1608–1610); incorporated into "The Theater of the Empire of Great Britain" (1611); "The History of Great Britain under the Conquests of the Romans, Saxons, Danes, and Normans" (1611). He died, July 28, 1629.

COMMON SPEEDWELL.

Speed, John Gilmer, an American journalist; born in Kentucky, Sept. 21, 1853; was graduated at the University of Louisville in 1869; practised as an engineer; became associated with several railroad companies; was city engineer of Louisville; and served also on the United States Board of Transportation at the Centennial Exposition in Philadelphia in 1876. In 1877 he gave up engineering and turned his attention to journalism. He joined the staff of the New York "World" in 1877; was its managing editor in 1879–1883; traveled abroad in 1883–1888; and was the editor of the "American Magazine" in 1889, and of "Leslie's Weekly" in 1896–1898. His publications include "A Fall River Incident"; "A Deal in Denver"; "The Gilmers in America"; and an edition of "Keats' Letters and Poems" (his mother was a niece of John Keats), and numerous magazine articles. He died Feb. 2, 1909.

Speedwell, the common name of plants of the genus *Veronica*, natural order *Scrophulariaceæ*, natives of temperate climates all over the world. The species consist of herbs, undershrubs, or shrubs, with opposite, alternate, or verticillate leaves. The flowers are of a blue, white, or red color, having two stamens, and are arranged in axillary or terminal spikes or racemes. *V. Virginica* has a white corolla. *V. officinalis*, or common speedwell, was once extensively used as a substitute for tea, and also as a tonic and diuretic. *V. teucrium*, or germander-leaved speedwell, has much the same properties as common speedwell, and *V. chamædrys*, or germander speedwell, is a very general favorite, on account of its being almost the first that opens its flowers in the early spring.

Speke, John Hanning, an English African explorer; born at Jordans, Somersetshire, May 4, 1827. In 1844 he entered the Indian army. He served with Sir Colin Campbell through the campaign in the Punjab, and during his annual leave of absence made exploring expeditions in the Himalayas and in Tibet, especially studying the botany, geology, and natural history of the region, and collecting specimens. He subsequently accompanied Captain Burton in his exploration of East Africa, and in 1858 they discovered Lake Tanganyika. In the same year Speke advanced till he reached the S. end of the Victoria Nyanza. Desirous of ascertaining whether the Nile has its source in that lake, he set out from Zanzibar in 1860, accompanied by Captain Grant, to find the N. end of the lake; and after heroic struggles against extraordinary difficulties he succeeded in his object, spent some time on the shores, and then, striking the Nile at Urondogani, retraced its course to the lake itself. His "Journal of the Discovery of the Source of the Nile" appeared in 1863, and a pamphlet, entitled "What Led to the Discovery of the Source of the Nile," in 1864. He died Sept. 15, 1864.

Spelling Reform, an attempt to change the present form of spelling certain words, advocated by several societies in the United States, England, and Canada. Many noted names have been connected with the movement, and eminent English-speaking philologists are still enlisted in its service. The appended set of rules formulated by the American Spelling Reform Association in 1884 gives an idea of lines on which the reform has been urged:

1. e.—Drop silent *e* when fonetically useless, as in *live*, *vineyard*, *believe*, *bronze*,

single, engine, granite, eaten, rained, etc.

2. **ea.**— Drop *a* from *ea* having the sound of *e*, as in *feather, leather, jealous,* etc.
   Drop *e* from *ea* having the sound of *a*, as in *heart, hearken,* etc.
3. **eau.**— For *beauty* use the old *beuty.*
4. **eo.**— Drop *o* from *eo* having the sound of *e*, as in *jeopardy, leopard.*
   For *yeoman* write *yoman.*
5. **i.**— Drop *i* from *parliament.*
6. **o.**— For *o* having the sound of *u* in *but,* write *u,* in *above,* (abuv), *dozen, some* (sum), *tongue* (tung), etc.
   For *women* restore *wimen.*
7. **ou.**—Drop *o* from *ou* having the sound of *u,* as in *journal, nourish, trouble, rough* (ruf), *tough* (tuf), and the like.
8. **u.**— Drop silent *u* after *g* before *a,* and in native English words, as *guarantee, guard, guess, guest, guild, guilt,* etc.
9. **ue.**— Drop final *ue* in *apologue, catalogue,* etc., *demagogue, pedagogue,* etc., *league, colleague, harangue, tongue,* (tung), etc.
10. **y.**— Spell *rhyme* rime.
11. Dubl consonants may be simplified.
    Final *b, d, g, n, r, t, f, l, z,* as in *ebb, add, egg, inn, purr, butt, bailiff, dull, buzz,* etc. (not *all, hall*).
    Medial before another consonant, as *battle, ripple, written* (writn), etc.
    Initial unaccented prefixes, and other unaccented syllables, as in *abbreviate, accuse, affair,* etc., *curvetting, traveller, etc.*
12. **b.**— Drop silent *b* in *bomb, crumb, debt, doubt, dumb, lamb, limb, numb, plumb, subtle, succumb, thumb.*
13. **c.**— Change *c* back to *s* in *cinder, expence, fierce, hence, once, peace, scarce, since, source, thence, tierce, whence.*
14. **ch.**— Drop the *h* of *ch* in *chamomile, choler, cholera, melancholy, school, stomach.*
    Change to *k* in *ache* (ake), *anchor* (anker).
15. **d.**— Change *d* and *ed* final to *t* when so pronounced, as in *crossed* (crost), *looked* (lookt), etc., unless the *e* affects the preceding sound, as in *chafed, chanced.*
16. **g.**— Drop *g* in *feign, foreign, sovereign.*
17. **gh.**— Drop *h* in *aghast, burgh, ghost.*
    Drop *gh* in *haughty, though* (tho), *through* (thru).
    Change *gh* to *f* where it has that sound, as in *cough, enough, laughter, tough,* etc.
18. **l.**— Drop *l* in *could.*
19. **p.**— Drop *p* in *receipt.*
20. **s.**— Drop *s* in *aisle, demesne, island.*
    Change *s* to *z* in distinctive words, as in *abuse* verb, *house* verb, *rise* verb, etc.
21. **sc.**— Drop *c* in *scent, scythe* (sithe).
22. **tch.**— Drop *t* in *catch, pitch, witch,* etc.
23. **w.**— Drop *w* in *whole.*
24. **ph.**— Write *f* for *ph,* as in *philosophy, sphere,* etc.

A new impetus was given to the movement when in March, 1906, an organization was formed by prominent scholars and men of affairs in the United States for the purpose of promoting it. This body, known as the "Simplified Spelling Board," was provided with a fund by Andrew Carnegie, and at once entered upon an active campaign. The board published and recommended for adoption—out of thousands equally eligible—300 "simplified spellings," including many of the changes in the above list and adding others. Almost half of the 300 forms recommended by the board already have the sanction of good usage or authority. In August, 1906, President Roosevelt, by executive order, directed that these spellings should be adopted by the Public Printer for public documents and used in executive correspondence. Congress, however, in December, 1906, showed opposition to the change, the order to the Public Printer was withdrawn, and the customary spelling was continued in government printing. Among the practical arguments of the reformers are these: That the irregular spelling of the English language causes a loss of two or three years of the school time of each child, and is mainly the cause of prevailing illiteracy; that it involves an expense of hundreds of millions of dollars annually for teachers and for writing and printing superfluous letters; and that it is an obstacle in many ways to the progress of the education of those speaking the English language and to its spread among other nations. Against the proposed changes it is objected that they would do violence to etymology and historical relationships, make the language more difficult to those accustomed to the previous forms, and impair the character of books already published in the prevailing style, necessitating much revision and reprinting. To these must be added many natural objections of a sentimental sort. While public discussion of these matters goes on, the Simplified Spelling Board, with various coadjutors, continues its work.

Spelman, Sir Henry, a British antiquary; born in Congham, Norfolk, in 1562; was educated at Trinity College, Cambridge, whence he passed to Lincoln's Inn. He was high sheriff of Norfolk in 1604, and was often employed in public affairs by James I. Knighted by the king, he retired in 1612 to prolonged private studies, and died in 1641. His ponderous "Glossarium Archæologicum," of which he published A—L in 1626, was completed by his son, Sir John Spelman, and William Dugdale. His next great work, "Concilia, Decreta, Leges, Constitutiones in Re Ecclesiastica Orbis Britannici" (1639-1664), he also left incomplete. His other works on "Tithes," "Sacrilege," etc., are no less learned, and exhibit his strong devotion to the Church of England. His "Reliquiæ Spelmannianæ" were edited, with a "Life," by (Bishop) Edmund Gibson (1698).

Spelt, a kind of wheat, *Triticum spelta.* It has a stout, almost solid straw, with strong spikes of grain. It grows in elevated parts of Central and Southern Europe.

Spelter, a commercial name for zinc; also a technical abbreviation of spelter-solder, an impure zinc of a yellowish color used in soldering brass joints.

Spence, Joseph, an English editor; born in Kingsclere in Hants, April 25, 1699. He went to Eton, but in a short time left it for Winchester, thence passing to New College, Oxford, in 1720, of which he became a fellow in 1722. He took orders in 1724, three years later became Professor of Poetry, and was presented to the rectory of Birchanger in Essex. He later published his "Essay on Pope's Odyssey" (1726), which procured him the lasting friendship of the poet. Almost from the beginning of their intimacy he began to record Pope's conversation and the incidents of his life, to which gradually many curious particulars were added gathered from the conversation of other eminent men. In 1736 he edited "Gorboduc," and in 1737 became rector of Great Harwood in Bucks, and regius Professor of Modern History. In 1747 he published his "Polymetis," which is said to have brought him $7,500, great part of which he spent on landscape gardening at Byfleet in Surrey. He was drowned at Byfleet, Aug. 20, 1768.

Spence, William, an English naturalist; born in 1783. The observation of the habits of animals, more especially insects, early formed a favorite pursuit with him. Having made the acquaintance of the distinguished entomologist Mr. Kirby, the result was the joint production of the well-known "Popular Introduction to Entomology." The first volume of this work appeared in 1815, and it was subsequently completed in four volumes in 1826. He died in London, Jan. 6, 1860.

Spencer, a four-cornered fore-and-aft sail, whose head is extended by a gaff and its foot usually by a sheet. Its position is abaft the fore or the main mast, and it is frequently bent to a spencer mast. It is a trysail to the fore or main mast, and differs from a spanker or driver in position. The latter belong to the mizzen.

Spencer, a town in Worcester co., Mass.; on the Boston and Albany railroad; 11 miles S. W. of Worcester. It contains the Richard Sugden Public Library, the David Prouty High School, a National bank, street railroad and electric light plants, and a number of weekly newspapers. It has manufactories of wire, boots, shoes, satinet, and woolen goods, and an assessed property valuation of nearly $3,500,000. Pop. (1890) 8,747; (1900) 7,627; (1910) 6,740.

Spencer, George John, Earl, an English bibliophile; son of the 1st Earl Spencer; born Sept. 1, 1758. He was educated at Harrow, and Trinity College, Cambridge. When he had completed his education he traveled, and on his return was elected member of Parliament for the county of Northampton. In 1789, by his father's death, he became Earl Spencer. In the House of Lords he voted with the Whigs till the period of the French Revolution, when he joined the party of Pitt and was for some time a member of the Pitt administration. Earl Spencer was president of the Roxburghe Club at its origination, and possessed the largest and richest private library in the world. A catalogue of the rarest and most costly works of the collection was prepared by Dibdin — "Bibliotheca Spenceriana, or a Descriptive Catalogue of the Books printed in the 15th Century, and of many Valuable First Editions" (4 vols. 1814). He died Nov. 10, 1834.

Spencer, Herbert, an English philosopher; born in Derby, April 27, 1820. His father was a schoolmaster in that town, and secretary of the Philosophical Society; and from him Spencer imbibed that love of natural science and wonderful faculty of observation so conspicuous in his works. The father was greatly interested in entomology; and Spencer himself used to collect, describe, and draw insects when a boy. Insurmountable aversion to linguistic studies put a Cambridge career out of the question, and at the age of 17 he entered on the profession of a railway engineer under Mr. (afterward Sir Charles) Fox, in London; but about eight years afterward he gave up this profession, which lacked interest for him. He had already contributed various papers to the "Civil Engineers' and Architects' Journal"; and in the later half of 1842 he wrote a series of letters to the "Nonconformist" newspaper on "The Proper Sphere of Government," which were republished in pamphlet form in 1843. These letters imply a belief in human progress based on the modifiability of human nature through adaptation to its social surroundings, and maintain the tendency of these social arrangements "of themselves to assume a condition of stable equilibrium."

From 1848 to 1853 he was sub-editor of the "Economist" newspaper; and at this time he developed the ethical and political consequences of the ideas he had already enunciated, and sought an independent basis for them. Hence his first important work, "Social Statics" (1850; abridged and revised, 1892). It is thus noticeable that Spencer's philosophical activity began with ethical and social questions. The conception of the evolution of man and society as determined by circumstances, and the idea that organic and social evolutions are under the same law, preceded the elaboration of those scientific ideas which in the complete "System of Philosophy" are made to serve as their basis. The truth anticipated by Harvey and Wolff, but first put into definite shape by Von Baer — "the truth that all organic development is a change from a state of homogeneity to a state of heterogeneity" — is regarded by Spencer as the organizing principle of his

subsequent beliefs. It was gradually developed and applied by him in a series of articles contributed in the following years to the "Leader," the "North British," "British Quarterly," "Medico-Chirurgical," "Westminster," and other reviews.

In these essays, especially those on "The Development Hypothesis" (1852), "Manners and Fashion" (1854), "The Genesis of Science" (1854), and "Progress: its Law and Cause" (1857), and in the volume of "Principles of Psychology" (1855), the doctrine of evolution began to take definite form, and to be applied to various departments of inquiry. The publication of Darwin's "Origin of Species," in 1859, gave a wide basis of scientific proof for what had hitherto been matter of speculation, and first showed the important part played by natural selection in the development of organisms.

In 1864 Spencer published an essay on the "Classification of the Sciences," in which he criticized Comte's serial arrangement of the sciences according to generality, and substituted for it a classification according to abstractness: (1) Abstract Science, treating of the forms (space and time) in which phenomena are known to us — logic and mathematics; (2) Abstract-concrete Science, treating of the laws of the factors of the phenomena themselves — mechanics, physics, chemistry, etc.; (3) Concrete Science, treating of the phenomena in their totalities (the laws of the products) — astronomy, geology, biology, psychology, sociology, etc.

On this scheme of the sciences Spencer had then been working for several years. As early as 1860 he had announced the issue of a "System of Synthetic Philosophy," already in course of preparation, which, beginning with the first principles of all knowledge, proposed to trace how the law of evolution was gradually realized in life, mind, society, and morality. In pursuance of this comprehensive design Spencer published "First Principles" (1862); "Principles of Biology" (2 vols. 1864–1867); "Principles of Psychology" (2d ed. 2 vols. 1870–1872); "Principles of Sociology" (3 vols. 1876–1896); "Principles of Ethics" (2 vols. 1879). In the preface to the third volume of the "Sociology" (1896) completing the "Synthetic Philosophy," the author explained that the two volumes of the original design had expanded to three; a fourth (linguistic, intellectual, moral, æsthetic) must remain unwritten by reason of age and infirmity.

These works follow a different plan from his earlier writings. In his occasional essays already referred to he proceeded by means of observation and induction; and in them the law of evolution was the result of a generalization. But the method

Spencer

of his "System" is deductive; though the deductions, large and small, are always accompanied by inductive verifications. Even the law of evolution only finds a place in it because it can be deduced from a higher and ultimate principle. Just as certain special sciences — mechanics, for example — have already entered into the deductive stage, so, in Spencer's "System," completely coördinated knowledge, to which he gives the name of philosophy, becomes deductive. Hence the importance of determining what is the ultimate test of truth. This, according to him, is the mental inconceivability of the negation of the proposition by the individual thinker. The validity of this test is supported, according to him, by two considerations: first, because no other test is obtainable, and secondly, by the consideration that mental inconceivability is the result of certain uniformities in our experience which are due to uniformities in nature. His appeal to this test, and the way in which he employed it, formed the subject of a controversy with John Stuart Mill, and brought out the distinction between his method and principles and those of the empirical philosophy.

Metaphysically Spencer's system is founded on the doctrine of relativity deduced by Hamilton and Mansel from Kant, but carried by him, as he says, a step further. Along with the definite consciousness of things known in relation to one another there is implied an indefinite consciousness of an absolute existence, in the recognition of which as inscrutable science and religion find their reconciliation. All definite consciousness or knowledge is of the manifestations of this unknowable power; and knowledge, completely unified, is philosophy. The data of philosophy are necessarily those organized components of our intelligence without which philosophizing could not go on. "Our postulates are: an unknowable power; the existence of knowable likenesses and differences among the manifestations of that power; and a resulting segregation of the manifestations into those of subject and object." Within each segregated mass there are likenesses and differences involving secondary segregations. The modes of cohesion under which manifestations are invariably presented are called, when contemplated apart, space and time; when contemplated along with their manifestations, matter and motion. All these are traceable to experiences of that mode of consciousness whose reality is shown by its persistence — to force.

By the "persistence of force" is meant the unchanging quantity both of that mode of force which is revealed to us only by opposition to our own powers and is not a worker of change, and of that mode which is a worker of change actual or potential,

and is specifically termed energy. The persistence of force — *i. e.*, the persistence of some cause which transcends our knowledge and conception — is the truth which all other truths imply, and from which they all (including the law of evolution) are derived. From the fact that force can neither arise out of nor lapse into nothing follows the uniformity of law. Force never disappears; it is only transformed. Motion follows the line of least resistance, and is perpetually reversed within limits — is rhythmical. So far of the factors of phenomena. The phenomena themselves must be under a law of the concomitant redistribution of matter and motion, which holds of every change. The law of the entire cycle of changes passed through by every existence is loss of motion and consequent integration — *i. e.*, evolution, eventually followed by gain of motion and consequent disintegration — *i. e.*, dissolution. In its complete shape the "formula of evolution" is thus stated: "Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite incoherent homogeneity to a definite coherent heterogeneity; and during which the retained motion undergoes a parallel transformation."

This law of evolution applies equally to all orders of phenomena — "astronomic, geologic, biologic, psychologic, sociologic, etc." — since these are all component parts of one cosmos, though distinguished from one another by conventional groupings. So long as evolution is merely established by induction it does not belong to philosophy. It must be deduced from the persistence of force. And this can be done. For any finite aggregate being unequally exposed to surrounding forces will become more diverse in structure; every differentiated part will become the parent of further differences; at the same time, dissimilar units in the aggregate tend to separate, and those which are similar to cluster together ("segregation"); and this subdivision and dissipation of forces, so long as there are any forces unbalanced by opposite forces, must end at last in rest; the penultimate stage of this process, "in which the extremest multiformity and most complex moving equilibrium are established," being the highest conceivable state.

The various derivative laws of phenomenal changes are thus deducible from the persistence of force, and it remains to apply them to inorganic, organic, and super-organic existences. The detailed treatment of inorganic evolution is omitted from Spencer's plan (which is, he remarks, even too extensive without it), and he proceeds "to interpret the phenomena of life, mind, and society in terms of matter, motion, and force."

Spencer

It is impossible to give here any but the most general idea of the contents of the volumes in which the law of evolution is applied to these different departments. It is not only made to account for the phenomena within each group, but also for the connection between one science and another. The researches of Darwin had accumulated ample material for showing the continuity of development, structural and functional, in plants and animals; and Spencer's view of biology, and the definition of life he proposed ("the definite combination of heterogeneous changes both simultaneous and successive in correspondence with external coexistences and sequences"), are meant to show its connection both with inorganic changes on the one hand and with mind on the other. Now, just as biology has to deal with the connection between phenomena in the organism, and as physical science treats of the connection between phenomena in the environment, so psychology has to do with the connection between these two connections. For this is said to be the objective aspect of what states of consciousness are subjectively. The functions dealt with by the psychologist are more special than those dealt with by the biologist; but they belong to psychology, not merely because they are more special, but also because they are the counterparts of the states of consciousness dealt with by the science of subjective psychology.

Objectively, an attempt is made to trace the evolution of mind from reflex action through instinct to reason, memory, feeling, and will, by the inter-action of the nervous system with its environment. Subjectively, mental states are analyzed, and it is contended that all of them — including those primary scientific ideas, the perceptions of matter, motion, space, and time, assumed in the "First Principles" — can be analyzed into a primitive element of consciousness, something which can only be defined as analogous to a nervous shock. These perceptions have now become innate in the individual. They may be called — as Kant called space and time — forms of intuition; but they have been acquired empirically by the race, through the persistence of the corresponding phenomena in the environment, and from the accumulated experiences of each individual being transmitted in the form of modified structure to his descendants.

This principle of heredity is one of the laws by which individuals are connected with one another into an organic whole; and we thus pass quite naturally to what Spencer calls super-organic evolution, implying the coördinated actions of many individuals and giving rise to the science of sociology. Society, like an individual man,

Spencer

is shown to be an organism from the fact and laws of its growth, the nature of its activities, and the inter-dependence of its parts; though it is distinguished from the individual organism in this, that it is discrete, while the latter is concrete: "there is no social sensorium." As societies progress in size and structure, they work on one another profound metamorphoses, now by war-struggles and now by industrial intercourse.

Assisted by a series of elaborate ethnographical charts, "Descriptive Sociology," prepared under his direction, Spencer had attempted to trace the development of human ideas, customs, ceremonial usages, and political institutions. The genesis of religion is traced to ancestor worship, or generally to worship of the dead. The notion of another life — from which the notions of gods and God are gradually evolved — is originated mainly by "such phenomena as shadows, reflections, and echoes" — these being looked upon as indications of a "double" or other self, which is not extinguished with the death of the first self. It is this fear of the dead which is the root of the religious control, just as it is the fear of the living which is the root of the political control. Ceremonies and institutions alike have their root in this fear of the stronger and submission to the conqueror. Thus, early communities being of the predatory or militant type tended to centralized control; while industrial communities, which are now most frequent, should tend to free institutions and to the restriction of the sphere of government to the negative duty of preventing the interference of one individual with his neighbor's liberty. This principle of government — commonly expressed by the maxim *laissez faire* — is energetically enforced by Spencer, against the tendency of much recent legislation. A still higher type than the industrial is possible in the future by inverting the belief that life is for work into the belief that work is for life; just as the industrial type inverts the belief that individuals exist for the state into the belief that the state exists for individuals.

The principles of morality are looked on by Spencer as the copestone of his system, all his other investigations being only preliminary to them. Ethics, he holds, has its root in physical, biological, psychological, and social phenomena, for by them the conditions of human activity are prescribed and supplied. The best conduct is that which most fully realizes evolution — which promotes the greatest totality of life in self, offspring, and the race — the balance of egoism and altruism being attained by a compromise between these contending principles. The measure of life is said to be pleasure, but the Utilitarian school is at fault in assuming that the end (greatest happiness) is better known than the means to it (morality); and in ignoring the fact that accumulated experiences of utility have become consolidated in the superior races into a moral sense.

In the above summary it has been impossible to give any idea of either the strength or weakness of the proof by which this elaborate system is supported. In general it may be said that its strength lies in the author's brilliant power of generalization, his acquaintance with many departments of science, and his unsurpassed wealth of illustration. The wide knowledge which all his writings display of physical science, and his constant endeavor to illustrate and support his system by connecting its positions with scientific facts and laws, have given his philosophy great currency among men of science — more so, indeed, than among philosophical experts. At the same time, not only have the development and application he has given to the theory of evolution profoundly influenced contemporary speculation and the recent developments of psychology and ethics, but he must also be regarded as one of the very few modern thinkers who have carried out the attempt to give a systematic account of the universe in its totality. The high opinion of his writings formed by foreign contemporaries led to many academic honors being pressed on him, which were, however, all alike declined. He died Dec. 8, 1903. See DARWINIAN THEORY: EVOLUTION.

Spencer, Jesse Ames, an American educator; born in Hyde Park, N. Y., June 17, 1816; was appointed Professor of Greek in the College of the City of New York in 1869, and was the author of a volume of religious "Discourses" (1843); "History of the English Reformation" (1846); "History of the United States" (4 vols. 1856–1869); "Greek Praxis" (1870), and a "Course of English Reading" (1873); "Memorabilia of Sixty-Five Years" (1820–1886); etc. He died Sept. 2, 1898.

Spencer, Platt Rogers, an American penman; born in East Fishkill, N. Y., Nov. 7, 1800; taught his first writing class in 1815; was employed as a clerk and bookkeeper in 1816–1821; studied law in 1821–1824; and subsequently taught in the common schools. Later he was county treasurer for 12 years, and in 1848 published a system of penmanship under the title "Spencer and Rice's System of Business and Ladies' Penmanship" which was followed by his "Spencerian or Semi-Angular Penmanship." Through his work and influence as a teacher he was instrumental in founding "business colleges" in the United States, and in promoting their

growth and development. He died in Geneva, O., May 16, 1864.

Spencer, William Loring (because of her masculine name called "The Major"), an American author, second wife of Gen. George E. Spencer; born in St. Augustine, Fla. She wrote: "Salt Lake Fruit" (1883); "Story of Mary' (1884), republished as "Dennis Day" (1887); "A Plucky One" (1887); and "Calamity Jane" (1887).

Spencer, William Robert, an English poet; born in 1770. Among his writings are: "Urania; or, the Illuminé," a comedy (1802); "The Year of Sorrow" (1804); a poetical necrology; a posthumous collection of "Poems" (1835). He translated Bürger's "Lenore" in 1796. Some of his songs are still popular favorites, as "Beth Gelert; or, The Grave of the Greyhound"; "Wife, Children, and Friends"; "When Midnight o'er the Moonless Skies"; "Too Late I Stayed: Forgive the Crime"; "The Emigrant's Grave." He died in Paris in 1834.

Spencer Gulf, an extensive inlet of South Australia; length about 200 miles, breadth at widest about 90 miles, and at inner extremity about 3 miles.

PHILIPP J. SPENER.

Spence's Metal, a substance made by melting together a metallic sulphide, such as sulphide of iron (iron pyrites), along with sulphur. The result is a grayish-black substance, without metallic luster, which takes a good polish. It can be colored to imitate bronze and other metals, and as it melts at 320° F. it can readily be cast into molds from which it takes a sharp impression. Busts, medallions, etc., have been made of it, and it is also used like lead for the joints of pipes. It is but slightly acted on by acids. First made in 1879, it is more of the nature of a hard cement than a metal.

Spener, Philipp Jakob, a German Lutheran divine; born in Rappottsweiler, Alsace, Jan. 13, 1635. In 1631 he commenced his theological studies at Strasburg, became in 1654 tutor to the Princess of the Palatinate, and delivered lectures on philosophy and history. In 1664 he was made doctor of theology at Strasburg, and in 1666 he received the office of senior clergyman at Frankfort-on-the-Main. In 1670 he instituted his celebrated *collegia pietatis*, which, against his will, became the origin of pietism. From 1686 to 1691 he was preacher to the court in Dresden. He went in 1691 to Berlin, and he took an active part in the foundation of the University of Halle. (See PIETIST.) He died in Berlin Feb. 5, 1705.

Spenser, Edmund, an English poet; born in London, England, probably in the year 1552. He entered as a sizar at Pem-

EDMUND SPENSER.

broke Hall, Cambridge, in 1569, became B. A. in 1573, and M. A. in 1576. In 1569 appeared a book "devised" by S. John Vander Noodt, the title of which begins, "A Theater wherein be represented as well the Miseries and Calamities that follow the Voluptuous Worldings, as also the greate joyes and Pleasures which the Faithfull do enjoy." This volume was prefaced by the first six of "Petrarch's Visions" done into verse styled "Epigrams," and 15 "Sonets," which were published subsequently among Spenser's works, in which publications they are said to have been "formerly translated." The poet left Cambridge for the N. of England, the dialect of which may be traced in his next published poem; his friend Gabriel Harvey, however, brought him S., and about the year 1578 introduced him to Sir Philip Sidney. To Sidney he dedicated "The Shepheardes Calendar" (1579), a set of pastorals only differing from the fashion of the times in giving honest rustic lan-

guage instead of courtiers' phrases to the shepherd swains; and next year this patron's influenee got Spenser the appointment of secretary to Lord Grey de Wilton, Lord-Lieutenant of Ireland. From that date till he visited England with Raleigh in 1589, it is probable that Spenser lived eontinuously in Ireland, gaining experienee whieh was afterward embodied in the "View of the State of Ireland," presented to the queen in 1596, but not printed till 1633.

In 1589 he was visited by Raleigh at Kileolman Castle, Cork eounty, where his friends obtained for him from Queen Elizabeth 3,028 aeres of land, the grant, which is extant, being dated Oet. 26, 1591. The "Faerie Queene" was already begun in 1580. and three books were finished by the close of the year 1589. Raleigh was so much delighted with what Spenser showed him of his poem, that he earried him over to England, where it was printed. Spenser was also introdueed to Elizabeth, who, a year after the publieation of the "Faerie Queene" (1590), made him virtually her laureate with a pension of $250 a year. In the same year he returned to Ireland, and no sooner was his baek turned on London than the publisher of the "Faerie Queene" gathered all scraps of his minor poems together and published them in a volume entitled "Complaints," which inelude "The Ruines of Time," "The Teares of the Muses," "Vergil's Gnat," "Mother Hubbard's Tale," "The Ruines of Rome by Bellay," "Muiopotomos, or The Tale of the Butterflie," "Visions of the World's Vanitie," "Bellayes," and "Petrarehes Visions."

In 1592 he married a lady named Elizabeth, to whom his "Amoretti," or "Sonnets" (1595), are addressed, and who is celebrated in his "Epithalamium," "the most perfeet of all his poems, the most beautiful of all bridal songs." He tells us that his wife, though beautiful, "was certes but a eountrey lasse." At the same time as the "Amoretti" appeared "Colin Clout comes Home Againe"; and probably at the close of the same year Spenser returned to England to superintend the publieation of books IV.–VI. of the "Faerie Queene." During his stay in England he wrote the "Hymns to Heavenly Love and Heavenly Beauty" and the "Prothalamium," his last works. In 1597 he returned to his quiet life at Kileolman, but in the next year Tyrone's rebellion foreed him to flee, for he represented the government as elerk of the eouneil of Munster, and was sheriff-designate of Cork. His house was burnt, and a ehild perished in the flames, aeeording to a statement made by Ben Jonson to Drummond of Hawthornden. Spenser reaehed England brokenhearted, and died, Jan. 16, 1599, in a tavern in King street, Westminster, "for lack of bread," as Jonson told Drummond. This, however, must have been an exaggeration, for though Spenser returned "inops," according to Camden, he was still in reeeipt of a pension, and must still have had influential friends. He was buried near Chaucer in Westminster Abbey.

After Shakespeare, Spenser ranks with Chaueer and Milton. For pure beauty — whether as regards the subjects of his deseriptions, or the rich harmony of their language — no poem eompares with the "Faerie Queene." Its aim is first of all religious. In the opening book we have the Red Cross Knight to represent the Christian, beloved of Una, the true Chureh, but beguiled into error by Duessa, or Popery. The knight is only restored to Una by the intervention of Prince Arthur, who is the leading character of the whole poem, and personifies "magnifieence" or magnanimity, "which vertue is the perfection of all the rest, and containeth in it them all." Book by book various virtues are personified; and the entire allegory is the splendid prototype of all such works as Bunyan's "Pilgrim's Progress." But while the story of chivalry is sustained, and allegorizes the history of the Christian Chureh, many other references are introdueed into it, and these are all woven into each other with great skill. Thus the "Faerie Queen" represents at onee Glory and Queen Elizabeth; Duessa represents Falsehood, Popery, and Mary of Seotland; Arthur represents chivalrous Magnanimity, Christ the Redeemer, and the Earl of Leicester. But all these are only the threads of the practical, on whieh is worked the richest of tapestry.

Spenser never draws tears, never quickens the pulse, but he is the omnipotent king of faney; and while he deals with Platonic virtues in a world of ehivalrous romance, yet so exquisitely and naturally associates all with the fresh fair world around us that we believe him utterly. In Bunyan the dramatically-embodied moral chiefly draws attention, and the merely mundane interest of the story is small; in Spenser the stern Puritanism underlying the allegory is hid to the eareless reader, who is presented with ever-shifting pictures of the pure external world, and hears more of the dignity than of the misery of man. Another eharm of the "Faerie Queene" is its "Spenserian stanza." This adds an Alexandrine to the eight-line stanza used by the old Freneh poets, and even by Chaueer. The old form eonsisted of two quatrains of ten-syllabled lines, alternately rhyming, but the seeond rhyme of the first quatrain agreeing with the first rhyme of the second. Spenser's last line rhymes with that preeeding it, and by disappointing the sustained expectation of eompleted rhythm with two additional syllables gives our verse one of its most majestic cadences. Spenser intended

the "Faerie Queene" to occupy 12 books, of which six only were accomplished. Spenser, while deeply impressed with the present, lived in a world that was departed, and consequently his poem took an antique cast, drawing its images, its manners, its scenery, and its very language from the past. "He stands between two worlds: he belongs partly to the new time, partly to the old; he is the last of one age, he is the first of another; he stretches out one hand to Chaucer, the other rests on the shoulder of Milton."

Spenserian Stanza, the stanza adopted by Edmund Spenser in his "Faerie Queene." It consists of a strophe of eight decasyllabic lines and an Alexandrine, and has a threefold rhyme, the first and third lines forming one, the second, fourth, fifth, and seventh another, and the sixth, eighth, and ninth the third. It is the stateliest of English measures, and was adopted by Byron in his "Childe Harold."

Spergula, in botany, spurrey; a genus of *Illecebraceæ* (Lindley), of *Alsineæ* (Sir J. Hooker). Sepals five, petals five, as large as the calyx, ovate, entire; stamens five or ten; styles five, alternate with the sepals; capsule with five entire valves, many-seeded.

CATHEDRAL OF SPEYER.

Species two or three, from temperate countries. One, *S. arvensis*, the corn spurrey, is European. It has stems 6 to 12 inches high, swollen at the joints; petals white. It is abundant in cornfields, and is sometimes cultivated as food for sheep.

Spermaceti, a neutral, inodorous, and nearly tasteless, fatty substance, extracted from the oily matter of the head of the sperm whale by filtration and treatment

with potash-ley. It is white, brittle, soft to the touch, sp. gr., 0.943 at 15°, melts from 38° to 47°, and is chiefly used in ointments and cerates. Spermaceti was formerly given as a medicine; now it is chiefly employed externally as an emollient and in the preparation of a blistering paper.

Spermatozoa, the microscopic animalcule-like bodies developed in the semen of animals, each consisting of a body and a vibratile filamentary tail, exhibiting active movements comparable to those of the ciliated zoöspores of the algæ, or the ciliated epithelial cells of animals. Spermatozoa are essential to impregnation.

Sperm Oil, the oil of the spermaceti whale, which is separated from the spermaceti and the blubber (see SPERMACETI). This kind of oil is much purer than train oil, and burns away without leaving any charcoal on the wicks of lamps. In composition it differs but slightly from common whale oil.

Spermophilus, in zoölogy, pouched marmots, a genus of *Sciuridæ,* sub-family *Arctomyinæ,* with 26 species, confined to the Nearctic and Palæarctic regions. Cheek pouches large; pollex rudimentary or absent. They appear first in the European Miocene and connect the squirrels with the marmots.

Sperm Whale, or **Cachalot,** the *Physeter macrocephalus,* a species of cetacea belonging to the section of the whale order denominated "toothed" whales, generally met with in the Pacific, but occasionally also on the coast of Greenland. The large blunt head in an old male is sometimes 30 feet long, and forms about a third of the total length of the body; while the "blow-holes" or S-shaped nostrils are situated in the front part of the head. The weight of an adult animal is estimated at about 200 tons, and in a male 66 feet long the flipper measured 5 feet 3 inches, and the two-lobed tail fin has a breadth of nearly 20 feet. The top of the back is continued almost in a straight line from the upper part of the head; the belly is enormous, but the body thins off toward the wide tail. The color is a blackish-gray, which may exhibit greenish or bluish hues on the upper parts. The teeth of the lower jaw average each about three inches in length. This whale is of considerable commercial value. See SPERMACETI.

Sperrylite, the name given to an arsenide of platinum ($PtAs_2$) discovered in 1888 in the province of Ontario, Canada.

Spessartine, or **Spessartite,** a variety of garnet containing a large percentage of protoxide of manganese. Dana makes this a special subdivision of the garnet group. Color, dark hyacinth-red with shades of violet. Found (among a few other localities) in large crystals at Haddam, Conn.

Spes Successionis, in Scotch law, the right or hope of succession. It may be sold, but it cannot be adjudged. In rights taken to parent and child, unless very explicit terms are used to limit the father's right to a life rent, he is understood to have the fee, and the child's right is merely a spes successionis.

Speusippus, an Athenian philosopher; born in 394 B. C., who after the death of his uncle Plato became head of the Platonic school or Older Academy. Of his philosophical works, in which he taught a doctrine differing but little from Plato's, nothing is left but titles and fragments. He died about 336.

Spey, a river in Scotland, issues from a lake of the same name in Inverness-shire, between Loch Laggan and Loch Lochy, flows N. E. through the beautiful valley of Strathspey, forming in part of its course part of the boundary between the counties of Elgin and Banff, and falls into the Moray Firth a little below Garmouth, after a course of about 96 miles. It has a very rapid course, is used for floating down timber, and is noted for its salmon fisheries.

Speyer, or **Speier** (in English often **Spire** and **Spires**), the capital of the Bavarian Palatinate; on the Rhine, 14 miles S. W. of Heidelberg. The most important buildings are the cathedral, the Hall of Antiquities, the Altpörtel, and the remains of the Retscher or imperial palace. The cathedral, reckoned the finest specimen of Romanesque architecture in Europe, was founded in 1030 by Konrad II. as a burial place for himself and his successors, and completed in 1061 by his grandson Heinrich IV., the opponent of Pope Gregory the Great. On several occasions it suffered severely at the hands of the French, especially in 1794, when it was turned into a barn; but in 1822 it was reconstructed, and in 1858 the work of restoration was completed. Its length is 485 feet, breadth of nave nearly 50 feet, height of the four towers 237 feet. The interior is richly decorated with some of the finest specimens of modern German art. Speyer has cigar and vinegar works, and does a little transit trade on the Rhine. Under the Romans Speyer was known as Augusto Nemetum, and during the Middle Ages it was a place of considerable importance, 29 imperial diets having been held within its walls, at one of which (1529) the Reformers offered the protest which procured for them the name of Protestants. During the wars of Louis XIV. in the Palatinate, Speyer was several times sacked by the French, and in 1689 the whole town was committed to the flames, the cathedral alone resisting the attempts of the French engineers to undermine it. Pop. (1900) 20,911.

Spezia, the principal naval port of Italy; near the head of a deep and commodious

bay on the W. side of the peninsula; 56 miles S. E. of Genoa. It was Napoleon I. who first recognized the suitability of this bay for the purposes to which the Italians, instigated thereto by Cavour, have now put it. An artificial breakwater (built in 1860), 2,400 feet long, covers the entrance; while formidable batteries of the heaviest artillery (supplemented by torpedo appliances) bristle on the hills that overlook the bay and on the island of Palmeria that guards its entrance. Here the Italians have constructed the great national arsenal, and build their large warships, and have their ship repairing yards and docks, and their naval victualling yards, store houses, etc. There are also in the town large barracks, a military hospital, as well as schools of navigation, an iron foundry, and manufactures of cables, sail-cloth, and white lead. The adjacent country produces excellent olive oil. The beauty of the bay and the lovely climate cause Spezia to be much frequented as a seaside resort. It was on the shores of this bay that Shelley spent the last few months of his life, while at the town of Spezia Charles Lever lived and wrote for some years. Pop. (1901) 65,612.

Spezzia, a Greek island at the entrance to the Gulf of Nauplia; area, 6½ square miles; pop. 6,899, engaged chiefly in commercial pursuits. The town of Spezzia has a good harbor.

Sphacelaria, in botany, the typical genus of *Sphacelaridæ*. Jointed, rigid, distichously-branched, feathery, filamentous fronds, of olive color, with an expanded terminal cell, containing a granular mass.

Sphæralcea, a genus of *Malveæ;* trees or shrubs, with toothed or three to five-lobed leaves, a three-leaved deciduous involucre, a five-cleft calyx, five petals. Chiefly from South America. A decoction of *S. cisplatina* is given in Brazil in inflammation of the bowels.

Sphæranthus, the typical genus of *Sphæranthea*. *S. indicus* (or *mollis*), a composite plant with globular heads of purple flowers, common in India in rice fields, is considered anthelmintic, alterative, depuratory, cooling and tonic, and diuretic. The powder of the root is said to be stomachic, and the bark ground and mixed with whey a remedy for piles.

Sphæria, the typical genus of *Sphæriacei*. Perithecia carbonaceous, completely exposed, partially sunk into the matrix, or covered by the cuticle and accompanied by a growth of threads constituting the mycelium. Known species about 500. They are found at all seasons on the trunks of trees, on leaves, on fir cones.

Sphæriacei, a sub-order of *Ascomycetes*. They have carbonaceous or membranaceous cysts, or perithecia composed of cells or very rarely of interwoven threads, with a pore or narrow slit at the top, which often ends in a nipple or crest. Lining the cysts is a gelatinous mass of asci and paraphyses (barren threads). Found on decayed wood, stems, algæ, dung, soil, etc.

Sphæridia, in zoölogy, stalked appendages with button-like heads covered with cilia, found in most recent sea-urchins. They are supposed to be organs of sense, probably of taste.

Sphærite, a mineral occurring in globular concretions without fibrous or concentric structure; hardness, 4; sp. gr., 2.536; luster, greasy-vitreous; color, light-grey; translucent. Composition: Phosphoric acid, 26.1; alumina, 47.4; water, 26.5 = 100, corresponding with the chemical formula $5Al_2O_3$, $2PO_5 + 16HO$. Occurs in fissures in limonite at Zajecov, Bohemia, in Lower Silurian schists.

Sphærocobaltite, a mineral found in small spherical masses, having crystalline structure, with roselite, at Schneeberg, Saxony. Color, externally velvet-black, internally rose-red; hardness, 4; sp. gr., 4.02–4.13. An analysis yielded: Carbonic acid, 34.65; protoxide of cobalt, 58.86; sesquioxide of iron, 3.41; lime, 1.80; water, 1.22 = 99.94, which corresponds to the formula $CoCO_3$, which requires, CO_2, 36.94, CoO, 63.06.

Sphærosiderite, or **Spherosiderite,** in mineralogy, a variety of siderite, occurring in globular form with radiating fibrous structure in cavities in basaltic rocks.

Sphærularia, a nematode or round parasitic worm existing in certain species of bees. The female is nearly an inch in length, and consists of little else than a mass of fatty tissue with reproductive organs, neither mouth, œsophagus, intestine, nor anus being present. The male is only about the 28,000th part the size of the female.

Sphagnum, in botany, the only genus of *Sphagnei*. It occurs in all temperate climates. At first only one species, *S. palustre*, was admitted, then it was multiplied into 14, then the number fell to four, then rose again to nine, though some were doubtful. They form a great part of every bog in moory districts. They make excellent bedding material; and when they become lumpy they can be restored to their original softness by being taken out, placed in water, and then dried. In the N. regions they are used for lining clothes, especially boots, and as wicks for lamps. They afford excellent material for enveloping and preserving the roots of plants which have to be sent a long distance.

Sphargididæ, a family of reptiles, comprising turtles whose general form is something like that of a flattened pyramid, and

the body is covered with a thick coriaceous skin, instead of a hard shell. *Sphargis* is the only genus, and is represented by *S. coriacea* of the Atlantic and Mediterranean, which is the largest of all turtles, in some cases attaining the weight of 1,200 to 2,000 pounds. One caught in Chesapeake Bay had a total length of almost eight feet.

Sphargis, in zoölogy, a genus of *Chcloniates,* with a single species, *S. coriacea,* often made the type of a family *Sphargidæ.* The skin resembles thick leather, and contains bony deposits arranged like mosaic, but this dermal shield is not united to the vertebræ and ribs. The bones of the paddles are extremely simple, and claws are absent. The genus is an extremely ancient type, little progress having been made in the development of a bony carapace; and Cope discovered in the Chalk of Kansas a form which he named Protostega, allied to Sphargis.

Sphegidæ, or **Sphecidæ,** a family of hymenopterous insects, winged in both sexes, and much resembling bees or wasps in gen-

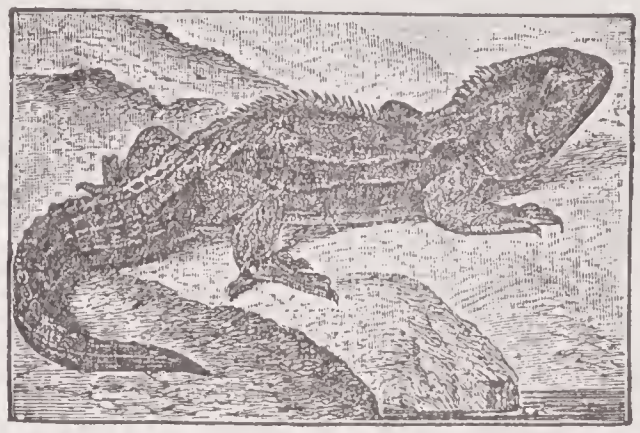
SAND WASP.

eral appearance. They are solitary in their habits. Many of them burrow in sand and are known as sand wasps. They are extremely active and restless, and may be seen running about on sand hills, with their wings in constant motion.

Sphene, a mineral composed of silicic acid, titanic acid, and lime. Its colors are dull yellow, green, gray, brown, and black. It is found amorphous and in crystals. The primary form of its crystal is an oblique rhombic prism.

Sphenoclase, a massive mineral which, when struck, breaks into wedge-shaped fragments; hardness, 5.5–6; sp. gr. 3.2; luster; feeble; color, pale grayish-yellow; subtranslucent. An analysis yielded: Silica, 46.08; alumina, 13.04; protoxide of iron, 4.77; protoxide of manganese, 3.23; magnesia, 6.25; lime, 26.50 = 99.87. Found at Gjellebäck, Norway, in layers in a granular limestone.

Sphenodon, a peculiar genus of lizards, regarded as forming a family by itself. The only known species (*S. punctatum*) is a



SPHENODON.

native of New Zealand, and though once abundant is now being rapidly thinned. Of late it has become the favorite food of the pig and is eaten by man. It frequents rocky islets, living in holes in the sand or among stones. It is also called *Hattcria punctata.*

Sphenoid Bone, an important bone of the skull, placed at the front part of the base, and articulating with all the other bones of the cranium. It consists of a body, two greater and two lesser wings or alæ, and two pterygoid processes projecting from its under surface. The upper surface bears the ethmoidal spine which articulates with the ethmoid bone; behind this spine are grooves for the olfactory and optic nerves. The body of the bone supports the pons varolii, and on each side of the body a deep groove (cavernous groove) lodges the internal carotid artery and the cavernous sinus. The posterior surface articulates with the basilar process of the occipital bone. The front surface of the sphenoid bone assists in forming the septum of the nose, and on either side of the front surface are the sphenoid cells or sinuses. The pterygoid processes of the sphenoid bone serve as points of attachments for important muscles.

Sphenography, the act or art of writing in cuneiform or arrow-shaped letters or characters; the art of deciphering cuneiform writings or characters; that branch of philological science which concerns itself with cunciform writings.

Sphenonchus (plural, **Sphenonchi**), in palæontology, one of the hooked cephalic dermal spines of hybodus and acrodus, specimens of which genera are in the British Museum, South Kensington, showing the spines (not more than four in any individual) *in situ,* but it is not known whether four was the normal number or if they occurred in all the species. On these spines Agassiz founded a genus *Sphenonchus,* which he placed with the *Hybodontidæ.*

This has, of course, lapsed, and the word sphenonchus has now no generic signification.

Sphenopteris, a genus of ferns, having the leaves twice or thrice-pinnate; the leaflets not adhering to the rachis by their whole base, but resembling small wedges reversed, the nervures dividing pinnately from the base. From the Devonian to the Wealden. In the Carboniferous rocks there are 34 species, and in the Jurassic 17.

Sphere, in astronomy, a term formerly applied to any one of the concentric and eccentric revolving transparent shells in which the heavenly bodies were supposed to be fixed, and by which they were carried so as to produce their apparent motions. The word now signifies the vault of heaven, which to the eye seems the concave side of a hollow sphere, and on which the imaginary circles marking the positions of the equator, the ecliptic, etc., are supposed to be drawn. It is that portion of limitless space which the eye is powerful enough to penetrate, and appears a hollow sphere because the capacity of the eye for distant vision is equal in every direction.

In geometry, a solid or volume bounded by a surface, every point of which is equally distant from a point within, called the center. Or it is a volume that may be generated by revolving a semicircle about its diameter as an axis. The distance from any part of the surface to the center is called a radius of the sphere. Every section of a sphere made by a plane is a circle, and all sections made by planes equally distant from the center are equal. A circle of the sphere whose plane passes through the center is a great circle; all other circles are small circles. All great circles are equal, and their radii are equal to the radii of the sphere. The surface of a sphere is equal to the product of the diameter by the circumference of a great circle; or it is equivalent to the area of four great circles. Denoting the radius of the sphere by r, and its diameter by d, we have the following formula for the surface:

$$s = 4\pi r^2 = \pi d^2 = 3.14159 \ . \ . \ d^2.$$

The volume of a sphere is equal to the product of its surface by one-third of its radius. It is also equivalent to two-thirds of the volume of its circumscribing cylinder. The following formula gives the value of the volume of any sphere, whose radius is r and diameter is d: $v = \frac{4}{3} \ \pi r^6$. Spheres are to one another as the cubes of their diameters.

In logic, the extension of a general conception; the individuals and species comprised in any general conception. The doctrine of the sphere is the application of geometrical principles to geography and astronomy. An oblique sphere, or spherical projection, is the projection made on the plane of the horizon of any place not on the equator or at the poles.

Sphere of Influence, a phrase used to denote the particular portion of Asiatic, African, or other territory occupied and dominated by any of the great powers of Europe for commercial, military, or political purposes. In the domination of China by Europe, the N. part including Tibet, Mongolia, Manchuria and the country round Peking, is in the Russian "sphere." Germany's "sphere" is in the region of Shan-Tung province. England's "sphere" is in Central China and near India. The French "sphere" is to the S. of the British and includes Annam. Africa has been partitioned largely among a few European countries. During recent years the securing of new "spheres of influence" has been the chief business of European diplomacy, and it is difficult at any one time to determine the boundaries of them because of constant changes.

Spherical Geometry, that branch of geometry which treats of spherical magnitudes, as spherical triangles, areas, and angles.

Spherical Lune, a portion of the surface of a sphere included between two great semicircles, having a common diameter. The angle of the lune is the same as the angle of the planes of the circles.

Spherical Polygon, a portion of the surface of a sphere bounded by the arcs of three or more great circles. Like plane polygons they are named from the number of sides or angles.

Spherical Projection, a representation of the surface of the sphere on a plane, according to some geometrical law, so that the different points in the representation can be accurately referred to their positions on the surface of the sphere.

Spherical Pyramid, a portion of a sphere bounded by a spherical polygon, and by three or more sectors of great circles meeting at the center of the sphere.

Spherical Sector, a portion of a sphere which may be generated by revolving a sector of a circle about a straight line through its vertex as an axis.

Spherical Segment, a portion of a sphere included between a zone of the surface and a secant plane, or between two parallel secant planes.

Spherical Triangle, a spherical polygon of three sides. It is a portion of the surface of a sphere bounded by the arcs of three great circles. The points where the arcs meet are called vertices of the triangle, and the arcs are called sides.

Spherical Trigonometry, See TRIGONOMETRY.

Spheriodical Condition of Liquids

Spheroidal Condition of Liquids. When liquids are thrown on incandescent metallic surfaces, they represent remarkable phenomena which were first observed by Leidenfrost a century ago. They have since then been studied by other physicists, and more especially by M. Boutigny, to whom our present knowledge of the subject is mainly due. When a tolerably thick silver or platinum dish is heated to redness, and a little water, previously warmed, dropped into the dish by means of a pipette, the liquid does not spread itself out on the dish, and does not moisten it, as it would at the ordinary temperature, but assumes the form of a flattened globule, which fact M. Boutigny expresses by saying that it has passed into the spheroidal state. It rotates rapidly round on the bottom of the dish, taking sometimes the form of a star, and not only does it not boil, but its evaporation is only about one-fifth as rapid as if it boiled. As the dish cools, a point is reached at which it is not hot enough to keep the water in the spheroidal state; it is accordingly moistened by the liquid, and a violent ebullition suddenly ensues. All volatile liquids can assume the spheroidal condition; the lowest temperature at which it can be produced varies with each liquid, and is more elevated the higher the boiling point of the liquid. For water, the dish must have at least a temperature of 200°; for alcohol, 134°; and for ether, 61°. The temperature of a liquid in the spheroidal condition is always below the boiling point. This property of liquids in the spheroidal condition remaining below their boiling point has been applied by M. Boutigny in a remarkable experiment — that of freezing water in a red-hot crucible. He heated a platinum dish to bright redness, and placed a small quantity of liquid sulphurous acid in it. It immediately assumed the spheroidal condition, and its evaporation was remarkably slow. Its temperature was about 11°, and when a small quantity of water was added it immediately solidified, and a small piece of ice could be thrown out of the red-hot crucible. In a similar manner Faraday, by means of a mixture of solid carbonic acid and ether, froze mercury in a red-hot crucible.

The common experimental method of exhibiting the spheroidal condition is easily performed thus: A metallic disk, slightly concave, like a watch glass, is heated by a lamp, and water is cautiously dropped on it from a pipette. If this be done before the disk is sufficiently heated, the water boils almost explosively and is dispersed at once in vapor. But when the disk is hot enough the water remains suspended above the surface; and the drop, when small, takes nearly the form of an oblate spheroid. Various proofs have been given, though they are obviously unnecessary, that there is no contact in this case. Thus, if the disk be very nearly flat, light passes freely between it and the drop. Again, if one pole of a galvanic battery be connected with the disk, and the other be dipped into the drop, a galvonometer interposed in the circuit shows that no current passes. By heating the disk sufficiently, and dropping on the water very carefully, we may easily keep in the spheroidal state as much water as, if not more than, it could hold when cold. It is not necessary that a metal plate be used — a watch glass will suffice for the experiment; but hot water must be dropped on it, else the glass will crack. Similarly liquids may be made to roll on liquids, and solid bodies which vaporize without becoming liquid also assume a condition analogous to the spheroidal condition of liquids when they are placed on a surface whose temperature is sufficiently high to vaporize them rapidly. This is seen when a piece of carbonate of ammonium is placed in a red-hot platinum crucible.

The phenomena of the spheroidal condition seem to prove that the liquid globule rests on a sort of cushion of its own vapor, produced by the heat radiated from the hot surface against its under side. As fast as this vapor escapes from under the globule, its place is supplied by a fresh quantity formed in the same way, so that the globule is constantly buoyed up by it and does not come in actual contact with the heated surface. When, however, the temperature of the latter falls, the formation of vapor at the upper surface becomes less and less rapid, till at length it is not sufficient to prevent the globule touching the hot metal or liquid on which it rests. As soon as contact occurs, heat is rapidly imparted to the globule, it enters into ebullition, and quickly boils away. These experiments on the spheroidal condition explain the fact that the hand may be dipped into molten lead, or even melted iron, without injury. It is necessary that the liquid metal be heated greatly above the solidifying point. Usually the natural moisture of the hand is sufficient, but it is better to wipe it with a damp cloth. In consequence of the great heat, the hand becomes covered with a layer of spheroidal fluid, which prevents the contact of the metal with the hand. Radiant heat alone operates, and this is principally expended in forming aqueous vapor on the surface of the hand. If the hand is immersed in boiling water, the water adheres to the flesh, and consequently a scald is produced. The tales of ordeals by fire during the Middle Ages, of men who could run barefooted over red-hot iron without being injured, are possibly true in some cases, and would find a ready explanation in the preceding phenomena.

Spherometer, an instrument for precisely measuring the radius of a sphere; also used for ascertaining the thickness of a plate. The usual form consists of a fine screw moving in a nut carried on the center of a small three-legged table. The lower ends of the screw and table-legs are finely tapered and terminate in hemispheres, so that each rests on a point. A vertical scale fastened to the table indicates the number of turns of the screw and serves as a fixed point for reading the divisions on the graduated screw-head. For determining the thickness of a plate, the instrument is placed on a horizontal surface, and the screw is turned till the point just touches, the exact instant of contact being indicated by a sudden diminution of resistance followed by a considerable increase. The screw-head and scale are read, the screw is raised, the thin plate slipped under it, and the process is repeated. The difference between the two readings gives the required thickness. To measure the radius of a sphere, the spherometer is leveled and read, then placed on the sphere, adjusted till the four points exert equal pressure, and read again. The difference gives the thickness of that portion of the sphere cut off by a plane passing through the three feet; and since the feet are equidistant, this distance being known gives the value of the radius. In the "well spherometer," which is adapted for measuring small spherical lenses, the true plane on which the instrument stands is perforated by a cylindrical well of known diameter. The spherometer can be used for testing the sphericity of a globe, and either on a convex or a concave surface.

Spherulite, in petrology, a name originally applied to a variety of pearl-stone or pitchstone, which consists of an aggregate of spheroidal concretions, but it is now applied to the parts of any rock which may have a similar structure.

Sphex, a genus of hymenopterous insects of the family *Sphegidæ*, closely allied to the true wasps. The sphex wasps are solitary in habit, and there are no workers as in the social forms. The female hollows out, at the end of a long passage, three or four chambers, in each of which she deposits an egg and a store of food for the larva she will never see. The food consists of grasshoppers or other insects, and Fabre gives a minute account of the way in which the sphex attacks her victim, and, after a long and violent struggle, throws it on its back and stings it in the neck and between the thorax and abdomen, each time piercing a ganglion. The insect, completely paralyzed, but alive, and therefore not liable to putrefaction, is then dragged to the mouth of the nest, where it is relinquished for a short time while the wasp enters alone to see that all is right. So automatic is this habit of reconnoitering that if the grasshopper be removed a little distance the wasp drags it back to the same spot and again enters alone. This was tested by the observer 40 times in succession, and each time the wasp paid her preliminary visit of inspection. But in proof that she is not wholly the slave of habit it should be noted that when Fabre substituted a fresh grasshopper for the paralyzed one she at once perceived the difference and proceeded to attack and sting her recalcitrant victim. Four paralyzed insects are placed in each chamber, which is sealed up as it is finished. When all are full the mouth of the passage is also closed, and the nest is abandoned.

Sphincter, in anatomy, a name applied generally to a kind of circular muscles, or muscles in rings, which serve to close the external orifices of organs, as the sphincter of the mouth, of the eyes, etc., and more particularly to those among them which, like the sphincter of the anus, have the peculiarity of being in a state of permanent contraction, independently of the will, and of relaxing only when it is required that the contents of the organs which they close should be evacuated.

Sphingidæ, the hawk moth family of *Lepidoptera*, comprising the most robust and powerful insects in the order, and generally distinguished by their strength of flight and large size. The antennæ are prismatic, and terminated by a little feather or thread; the tongue is often extremely long, in some species even exceeding the whole body in length; the labial palpi are broad and compressed and closely covered with scales; the labrum and mandibles are minute; the body is long, and acute behind; and the wings, especially in the hinder pair, small. The caterpillars are naked, cylindrical, and 16-footed; they are ornamented with pale oblique eyes upon the sides of the body, and are usually furnished with a short horn on the back of the 11th segment. They descend into the earth to become pupæ, which are naked and conical.

Various modifications occur in the character of the imago in this family. The maxillæ vary considerably in length, exceeding that of the entire body in sphinx, but scarcely exceeding that of the head in the death's-head hawk moth (*Achcrontia atropos*) and in *Smerinthus* not longer than the labial palpi; this variation in length corresponds with the rapidity of flight and the habit of the insects of extracting the nectareous juices of tube-bearing flowers by means of their elongated tongue. The caterpillars of the typical species are remarkable for the attitude in which they are usually seen, and from which they have obtained the genuine name of *Sphinx*, from their supposed resemblance to the figure of that fabulous creature.

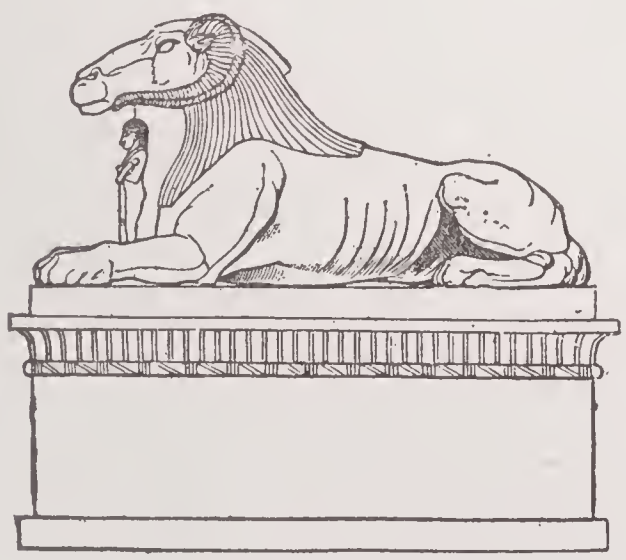
Sphinx

Some of them are also remarkable for the faculty they possess of elongating and contracting the three anterior segments of the body, giving them somewhat of a proboscis-like appearance, whence they have been termed elephant sphinxes.

Sphinx, a Greek word signifying the "strangler," applied to certain symbolical forms of Egyptian origin, having the body

GREEK SPHINX.

of a lion, a human or an animal head, and two wings. Various other combinations of animal forms have been called by this name, though they are rather griffins or chimæras. Human-headed sphinxes have been called andro-sphinxes; that with the head of a



EGYPTIAN SPHINX.

ram, a criosphinx; and that with a hawk's head, a hieracosphinx. The form when complete had the wings added at the sides; but these are of a later period and seem to have originated with the Babylonians or Assyrians. In the Egyptian hieroglyphics the wingless sphinx bears the name of *Neb*, or lord, and *Akar*, or intelligence, corresponding to the account of Clement that this emblematic figure depicted intellect and force. Others see in it the idea of resurrection, symbolized by the triumph of the dawn over the darkness of night. The idea that it allegorized the overflow of the Nile when the sun was in the constellations Leo and Virgo appears to be unfounded. In Egypt the sphinx also occurs as the symbolical form of the monarch considered as a conqueror, the head of the reigning king being placed on a lion's body, the face bearded, and the usual head dress. Thus used, the sphinx was generally male; but in the case of female rulers that figure has a female head and the body of a lioness.

The most remarkable sphinx is the Great Sphinx at Gizeh (Gîza), a colossal form hewn out of the natural rock, and lying about a quarter of a mile S. E. of the Great Pyramid. It is sculptured out of a spur of the rock itself, to which masonry has

THE SPHINX NEAR GIZEH.

been added in certain places to complete the shape, and it measures 172 feet 6 inches long by 56 feet high (Vyse, "Pyramids" iii: 107). Immediately in front of the breast Caviglia found in 1816 a small naos or chapel, formed of three hieroglyphic tablets, dedicated by Thothmes III. and Rameses II. to the sphinx, whom they adore under the name of Haremkhu, or Harmachis, as the Greek inscriptions found at the same place call it — *i. e.*, the Sun on the Horizon. These tablets formed three walls of the chapel; the fourth, in front, had a door in the center and two couchant lions over it. A small lion was found on the pavement, and an altar between its fore paws, apparently for sacrifices offered to it in the time of the Romans. Before the altar was a paved causeway or dromos, leading to a walled staircase of 30 steps, repaired in the reign of M. Aurelius and L. Verus on May 10, 166, A. D. In the reigns of Severus and his sons, A. D., 199–200, another dromos, in the same line as the first, and a diverging staircase were constructed, while some additions had been made to the parts between the two staircases in the reign of Nero. Votive inscriptions of the Roman period, some as late as

the 3d century, were discovered in the walls and constructions; and on the second digit of the left claw of the sphinx an inscription in pentameter Greek verses, by one Arrian, probably of the time of Severus, was discovered. In addition to these walls of unburnt brick, galleries and shafts were found in the rear of the sphinx extending toward the N.

The excavations of M. Mariette in 1852 threw further light on the sphinx, discovering that it was surrounded by a peribolos or outer wall; and showing that the head only was sculptured; that the sand which had accumulated round it was brought by the hands of man and was not an encroachment of the desert; and that the masonry of the belly was supported by a kind of abutment. To the S. of the sphinx Mariette found a dromos which led to a temple of the time of the 4th dynasty, built of huge blocks of alabaster and red granite. In the midst of the great chamber of this temple were found seven diorite statues, five mutilated and two entire, of the monarch Chafra or Chephren, which are fine examples of the oldest Egyptian sculpture. While the dignity and grandeur of the Great Sphinx have often attracted the admiration of travelers, its age has always remained a subject of doubt; but these later discoveries prove it to have been a monument of at least the age of the 4th dynasty, or contemporary with the pyramids, and Maspero regards it as anterior even to Menes.

Besides the Great Sphinx, avenues of sphinxes have been discovered at Sakkara, forming an approach to the Serapeum of Memphis, and elsewhere. Sphinxes of the time of the Shepherd dynasty have been found at Tanis, and another of the same age is in the Louvre; while a granite sphinx, found behind the "vocal Memnon," and inscribed with the name of Amenophis III., is at St. Petersburg. An avenue of criosphinxes, each about 17 feet long, is still seen at Karnak, and belongs to the time of Horus, one of the last monarchs of the 18th dynasty. Various small sphinxes are in the different collections of Europe, but seldom are of any very great antiquity.

The Theban sphinx of Greek legend, whose myth first appears in Hesiod, is described as having a lion's body, female head, bird's wings, and serpent's tail, ideas probably derived from Phœnician sources. She was said to be the issue of Orthros, the two-headed dog of Geryon, by Chimæra, or of Typhon and Echidna, and was sent from Ethiopa to Thebes by Hera to punish the transgression of Laius, or according to other accounts, by Dionysus or Ares. The sphinx was a favorite subject of ancient art, and appears in reliefs, on coins of Chios and other towns, and often as a decoration of arms and furniture. In Assyria and Babylonia representations of sphinxes have been found, and the same are not uncommon on Phœnician works of art.

Sphinx Baboon, the *Cynocephalus sphinx*, a large species from the West of Africa. They are good-tempered and playful when young, but become morose and fierce as they grow older. They bear confinement well, and are common in menageries.

Sphinxland, Egypt.

Sphinx Moth (*Sphinx Convolvuli*), a species of moth belonging to the family *Sphingidæ*, and deriving its popular name from a supposed resemblance which its caterpillars present when they raise the fore part of their bodies to the "sphinx" of Egyptian celebrity. The sphinx moth is common in some parts of the United States.

Sphrigosis, over rankness, a disease in fruit trees and other plants, as turnips, in which the plant tends to grow to wood or stem and leaves in place of fruit or bulb, etc., or to grow so luxuriantly that the nutritious qualities of the plant are injured, as in the potato.

Sphygmograph, an instrument used for recording the character of the movements of the pulse. An instrument for this purpose was constructed by Ludwig in 1847, and several forms of sphymograph are now in use. That most generally employed was first described by Marey in 1863. It consists of an ivory pad which rests on the pulse and is connected with one end of a delicate spring, the other end of the spring being fastened to a framework. The movements of the pulse, acting on the pad, are communicated to a system of two light levers, one of which carries a small point, or pen, which produces a trace on a piece of smoked glass or paper attached to a brass plate, which is moved along by clockwork. The character of the trace thus produced depends upon the character of the movements of the pulse, which are magnified about 50 times by means of the levers. The information gained by the examination of these sphymographic traces is of the greatest value in the diagnosis of affections of the heart, etc.

Sphygmophone, an instrument devised to enable a person to determine the rhythms, etc., of the pulse at a distance by means of the electric wire. The gas sphygmoscope is sometimes modified so as to render the variation of the pulse audible.

Sphygmoscope, an instrument for rendering the movements of the pulse visible. Marey's sphygmoscope consists of a small glass cylinder containing a small india-rubber bag, connected with a receiving and a registering tambour. The expansion of the india-rubber bag, consequent on the pressure on the receiving tambour, compresses the air in the cylinder and so affects the re-

corder. The gas sphygmoscope consists of a metal chamber with a bottom of delicate membrane, with a service pipe at the side and a fine burner at the top. When the membrane is placed over an artery and the gas lit, the movements of the pulse are shown by movements of the flame.

Sphyrænidæ, a family of teleostean fishes allied to the perch, but having abnormal ventral fins. There are two dorsal fins, and the scales are cycloid. The teeth are numerous and sharp. The Barracouda pike is a good example. This fish occurs in the Atlantic Ocean and is a very formidable creature.

Spica Virginis, or **Spica Azimeth,** in astronomy, a star of the first magnitude, Alpha Virginis, in the constellation Virgo. If a line be drawn through two opposite angles of the rectangular figure in the Great Bear, and prolonged with a slight curve, it will pass through Spica Virginis.

Spice Islands. See MOLUCCAS.

Spices, aromatic and pungent vegetable substances used as condiments and for flavoring food. They are almost exclusively the productions of tropical countries. In ancient times and throughout the Middle Ages all the spices known in Europe were brought from the East; and Arabia was regarded as the land of spices, but rather because they came through it or were brought by its merchants than because they were produced in it, for they were really derived from farther E. They owe their aroma and pungency chiefly to essential oils which they contain. They are yielded by different parts of plants; some, as pepper, cayenne pepper, pimento, nutmeg, mace, and vanilla, being the fruit or particular parts of the fruit; while some, as ginger, are the root stock; and others, as cinnamon and cassia, are the bark. Tropical America produces some of the spices, being the native region of cayenne pepper, pimento, and vanilla; but the greater number are from the East.

Spider, in zoölogy, the popular name of any individual of Huxley's *Arancina.* The species are very numerous and universally distributed, the largest being found in the tropics. The abdomen is without distinct divisions, and is generally soft and tumid; the legs are eight in number, seven-jointed, the last joint armed with two hooks usually toothed like a comb. The distal joint of the falces is folded down on the next, like the blade of a pocket knife on the handle, and the duct of a poison gland in the cephalothorax opens at the summit of the terminal joint. There are two or four pulmonary sacs and a tracheal system; eyes generally eight in number; no auditory organs have been discovered. Their most characteristic organ is the arachnidium, the apparatus by which fine silky threads — in the majority of the species utilized for spinning a web — are produced. In *Epeira diadema,* the common garden spider, more than 1,000 glands, with separate excretory ducts, secrete the viscid material of the web. These ducts ultimately enter the six prominent arachnidial mammillæ, projecting from the hinder end of the abdomen, and having their terminal faces beset with minute arachnidial papillæ, by which the secretion of the gland is poured out.

COMMON SPIDER. (1) male, (2) female.

By means of these silky threads, spiders form their dwellings and construct ingenious nets for the capture of their prey; these threads serve also as a safeguard against falling, and as a means of support from one elevated object to another, being thrown out as a sort of flying bridge. The webs are in high repute for stanching blood; the threads are employed for the cross lines in astronomical telescopes, and have been made into textile fabrics as articles of curiosity. Spiders are essentially predaceous, and adopt various devices as nets, traps, and ambushes, for the capture of their prey; but the fate of the victim is always the same — the claw joints of the falces are buried in the body, inflicting a poisonous wound, and the juices are then sucked out by the muscular apparatus appended to the œsophagus of the spider. The bite of none of the species is dangerous to man. (See TARANTULA.) They are extremely pugnacious, and in their combats often sustain the loss of a limb, which, like the Crustaceans, they have the power of reproducing. The males are smaller than the females, which they approach with great caution, as they run great risk of being devoured, even at the time of impregnation. The eggs are numerous, and usually enveloped in a cocoon or egg case; the young undergo no metamorphosis. See also TRAPDOOR.

Spider Crab, the name given to crabs of the family *Maiadæ* from the rough general resemblance their bodies and long legs possess to those of spiders. The *Maia squinado,* or common or thornback spider crab, is quite a familiar species, and is very commonly taken in the crab pots of fishermen. The four-horned spider crab (*Arctopsis tetraodon*) has a triangular body, with four horn-like processes in front, the two central ones forming the rostrum or beak.

Spider Farming. Here and there a spider has been made a pet of by some prisoner of Chillon or of the Tombs, but spider farming as a money-making industry is yet

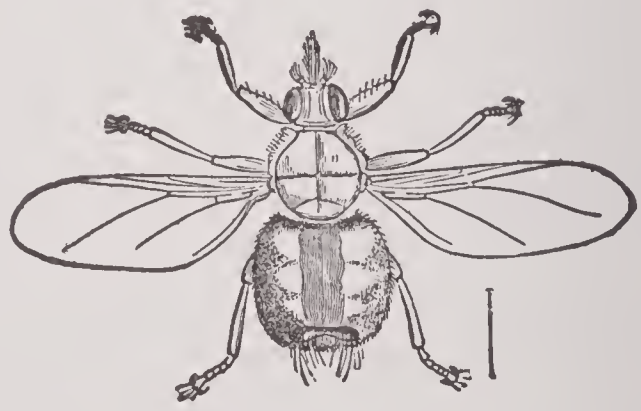
in its infancy. What in the world is done with a crop of spiders? is asked. One has only to go 4 miles from Philadelphia on the old Lancaster Pike and ask for the farm of Pierre Grantaire, to see what can be found nowhere else in the United States, and abroad only in a little French village in the department of the Loire. Pierre Grantaire furnishes spiders at so much a hundred for distribution in the wine vaults of the merchant and the nouveau riche. His trade is chiefly with the wholesale merchant, who is able to stock a cellar with new, shining, freshly labelled bottles, and in three months see them veiled with filmy cobwebs, so that the effect of 20 years of storage is secured at a small cost. The effect on a customer can be imagined, and is hardly to be measured in dollars and cents. It is a trifling matter to cover the bins with dust. That effect is easy to the veriest tyro in the wine trade. But cobwebs — that is different — cobwebs spun from cork to cork, cobwebs that drape the slender neck like delicate lace when the flash is brought to the light — the seal of years of slow mellowing and fruition.

The spider "farm" occupies several rooms of the Grantaire homestead. The walls are covered with wire squares from six inches to a foot across, like magnified sections of the wire fence used to inclose poultry yards. Behind these wire screens the walls have been covered with rough planking. There were cracks between the boards, apparently left with design, and their weather-beaten surfaces were dotted with holes and splintered crevices. Long tables running the lengths of the room are covered with small wire frames, wooden boxes and glass jars.

All of these wires in the room are covered over by patterns of lace drapery, in the geometrical outlines fashioned by the spider artists, inspired by the mysterious instinct which has made them weave their filmy snares in the same fashion since the world began. The sunlight streams through the open door and the room seems hung with curtains of fine woven lacework. The king of this fairy palace raps his stubby pipe against the door, and the webs were dotted with black spots as the spiders scampered from their retreats in the wall cracks and a score of villainous-looking pets, as big as half-dollars, emerged from their crannies on the table and clustered against their glass roofing, expecting to be fed. At the time of the writer's visit there were 2,000 spiders in this room, all raising families and minding their own business. "You see," said the spider farmer, "in these frames I breed my pets, and when the infants are big enough to run about I take them in the next room, where they can set up for themselves, as you say. It is from there I sell most. They are great cannibals, my pets; they eat their children and the children eat each other. So I must get a good price for those that survive their childhood. It is not all kinds of spiders that make webs. There are those that live in holes in the ground and make for themselves trap doors, and some make soft nests in cracks, while others spin small homes in the grass or in the room corner. No, indeed; I have sought out kinds that weave themselves fine large webs of lines and circles. They only look artistic in the wine cellar or on the bouteille. They are selected ones. There are three families; the names of them are: *Spira vulgaris*, the *zilla*, and the *Nephila plumipies*, which the entomologists will tell you are the grand web spinners, the artists of the spider world. It is a science, this raising of spiders. I have on hand at one time about 10,000 spiders, old and young. I brought some eggs from France, and the choicest webmakers to be found. Here is the queen of them all. Her children are the superb spinners. Many hundreds of my pets are her descendants. It is the kind bred by my great uncle in France."

The old man led the way to a glass dome in the corner, beneath which a filmy web of beautiful pattern stretched across nearly two feet. Pierre touched one of the meshes and a huge black spider danced nimbly out from her downy nest and ran up the vibrating thread to the old man's finger. He gave her a fly, and she tripped back within doors with her booty.

Spider Fly (*Ornithomyia*), a genus of dipterous insects, chiefly allied to the forest fly. The genus are parasitical on birds,

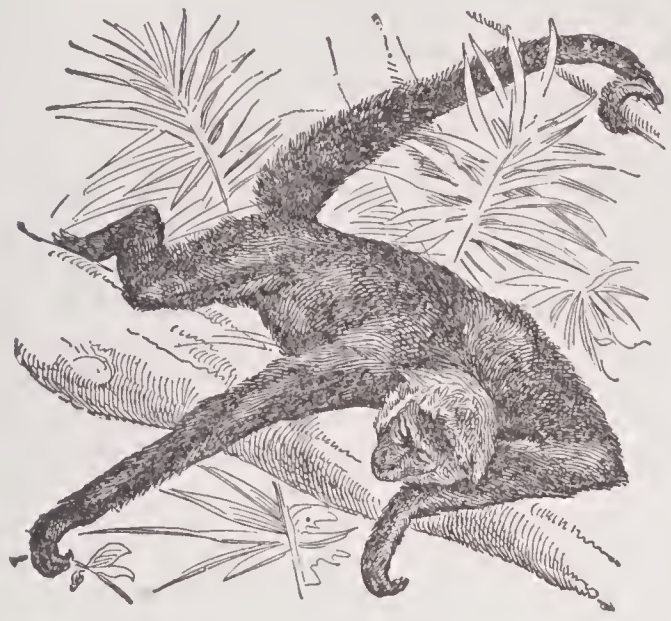


SPIDER FLY.

never on quadrupeds. *O. avicularia* frequently infests the common fowl, the blackcock, and other birds. It is greenish-yellow, with smoke-colored wings.

Spider Monkey, a general name applied to many species of platyrhine or New World monkeys, but more especially to the members of the genus *Ateles*, which are distinguished by the great relative length, slenderness, and flexibility of their limbs, and by the prehensile power of their tails.

A familiar species is the chameck (*A. Chameck*), which occurs abundantly in Brazil. The body is about 20 inches, the tail 2 feet



SPIDER MONKEY.

long, and the color is a general black. The coaita (*A. panicus*), another typical species, has an average length of 12 inches; the tail measures over 2 feet long, and the fur is of a glossy black hue.

Spiderwort, the common name of plants of the genus *Tradescantia,* one species of which, *T. virginica,* is cultivated in gardens.

Spiegeleisen, a name applied by the Germans to a variety of cast iron which is coarsely crystalline, the large crystal planes having bright reflections. Numerous analyses show that it contains about 5 per cent. of combined carbon, but although most, if not all, analyses show a fair proportion of manganese to be present it is still regarded as uncertain whether this element or the combined carbon determines the crystallization.

Spielhagen, Friedrich, a German novelist; born in Magdeburg, Feb. 24, 1829, but passed all his youth at Stralsund. From the gymnasium there he proceeded in 1847 to the universities successively of Bonn, Berlin, and Greifswald, afterward settling at Leipsic in 1854 as a docent, at Hanover in 1859, and at Berlin in 1862, in the last two places till 1884 as a newspaper editor. His works, of which eight have been translated into English, are some 30 in number, in over 50 volumes, and include: "Klara Vere (1857); "On the Dunes" (1858); "Enigmatical Natures" (1860); "Through Night to Light" (1861); "The Von Hohensteins" (1863); "Little Rose of the Court" (1864); "In Rank and File" (1866); "The Village Coquette" (1868); "Hammer and Anvil" (1868); "German Pioneers" (1870); "Ever Onward" (1872); "What the Swallow Sang" (1872); "Ultimo" (1873); "The Fresh-et" (1876); "Flatland" (1878); "Quisisana" (1879–1880); "Angela" (1881); "Uhlenhans" (1884); "At the Health Springs" (1885); "What Will That Lead to?" (1886); "Noblesse Oblige" (1888); "A New Pharaoh" (1889); "Sunday's Child" (1893); "Susi" (1895); and many dramatic works and much miscellany. He died Feb. 25, 1911.

FRIEDRICH SPIELHAGEN.

Spigelia, a genus of plants, order *Loganiaceæ.* They are herbaceous or suffrutescent plants, with leaves opposite; stipules small, interpetiolar; flowers sessile, in terminal spikes. The most important species is *S. Marylandica,* the pink root, or worm grass, found in woods from Pennsylvania to Florida and W. to Illinois. Its root and leaves are much employed as anthelmintics. In larger doses they operate as irritant cathartics, and in poisonous doses as narcotics.

Spike, in botany, that kind of inflorescence in which sessile flowers, or flowers having very short stocks, are arranged around an axis, as in the greater plantain, common vervain, common lavender, and some species of sedge. In rye, wheat, barley, darnel, and many other grasses there is a sort of compound spike — *i. e.,* the flowers or fruits are arranged together in spikelets on short stalks, which again surround the top of the culm in the form of a spike. The catkin, the spadix, and the cone may be regarded as varieties of the spike.

Spikenard, in botany: (1) *Nardostachys jatamansi,* called in Hindustan jatamansi and balckhar. The root, which is from 3 to 12 inches long, sends up many stems, with little spikes of purple flowers, which have four stamens. It grows in the Himalayas at an elevation of from 11,000 to 15,000, or in Sikkim to 17,000 feet. (2) *Valeriana celtica,* and in various countries other plants.

In perfumes, an aromatic substance derived from the root of *Nardostachys jatamansi*. It was highly prized by the ancients, and used by them both in baths and at feasts as an unguent, and the women of Nepal still employ oil in which the root has been steeped for perfuming their hair. The "ointment of spikenard" with which our Lord was anointed as He sat at meat in the house of Simon of Bethany was prepared from it. Its costliness may be inferred from the indignant surprise of Judas (John xii: 5). Sometimes applied to the ointment itself.

Spike Oil, a volatile oil obtained by distilling *Lavandula Spica* (a species of lavender) with water. It has a less agreeable odor than true lavender oil, and is specifically heavier. It is obtained from the leaves and stalks of the plant, true lavender oil from the flowers.

Spike-wheel Propeller, a mode of propulsion of canal boats, in which a spiked wheel, driven by the engine, is made to track on the bottom of the canal and thus draw the boat. The spike-wheel operates outside the boat, or in a compartment inside open at bottom.

Spiking, the operation of quickly rendering a muzzle-loading gun useless, resorted to by troops compelled to abandon their own pieces or unable to remove those of the enemy which they have captured. The process consists in driving a cast iron spike into the vent or touch hole and then breaking it off short with a hammer. A spiking party of artillerymen always accompanied a storming party. To render a spiked gun again serviceable it was generally necessary to drill a fresh vent. Breech loading guns are best rendered temporarily unserviceable by removing part of the breech mechanism.

Spilanthes, a genus of tropical weeds, order *Asteraceæ*, the leaves of many of which have a singularly pungent taste, which is especially noticeable in the Pará cress, *S. oleracea*. This plant is cultivated as a salad and potherb in tropical countries, and, like many cultivated plants, its native country is uncertain. The Japanese call the plant *Hoko So*.

Spinach, or **Spinage,** a wholesome though somewhat insipid vegetable, consisting of the leaves of *Spinacia oleracea*, a diœcious annual belonging to the natural order *Chenopodiaceæ*. It is a native of Siberia, whence it passed W., reaching England more than three centuries ago. The fleshy leaves are somewhat triangular in outline, deep green in color, and for table are generally served boiled and chopped, or as an ingredient in soups and stews. Three varieties are in cultivation — the round-seeded, the Flanders, and the prickly-seeded, which unitedly yield a continued supply from April to November, and to a moderate extent through winter and spring. The plant is of rapid growth, but that the leaves may be succulent and properly flavored the soil should be rich and the situation open and airy. *S. tetrandra*, from the Caucasus, an annual and unisexual herb, is of equal value to the preceding, though less known. The name has also been given to several plants not belonging to *Spinacia*. New Zealand spinach is *Tetragonia expansa*, a trailing plant with thick succulent leaves, native of Australasia, South America, and Japan. Patience spinach (*Rumex patientia*) was formerly common in gardens. The beet spinach (*Beta cicla*),

COMMON GARDEN SPINACH.

a native of the seashores in Southern Europe, has long been grown for its leaves, which are dressed in the same manner as spinach.

Spina Bifida, a tumor formed by a congenital hernia of the spinal membranes through a cleft in the arches of the vertebræ by incomplete coalescence of their laminæ. It is often associated with other congenital deformities, and, as a general rule, children so affected do not long survive, though there are cases on record in which persons with spina bifida have survived beyond middle life. When operation is deemed necessary, the tumor should be tapped with a fine trocar on one side, and the fluid should be drawn off sufficient to relieve the tension, and a few drops of the pure tincture of iodine injected into the remainder. A shield, or compress, of gutta-percha well padded should then be applied. Professor Morton of Glasgow successfully treated several cases of spina bifida by the injection of iodo-glycerin.

Spinal Cord, the name given in anatomy to the great cord or rod of nervous matter which is inclosed within the backbone or spine of vertebrates. The spinal cord in man, which is from 15 to 18 inches long, has direct connection with the brain by

means of the medulla oblongata, and passes down the back till it terminates in a fine thread at the level of the first lumbar vertebra. Lodged in the bony vertebræ it varies in thickness throughout, and like the brain is invested by membranes called respectively pia mater and dura mater. Situated between these two are the delicate layers of the arachnoid membrane, inclosing a space which contains the cerebrospinal fluid. Besides these protective coverings there is also a packing of fatty tissue which further tends to diminish all shocks and jars. The spinal nerves, to the number of 31 on each side, pass out from the cord at regular intervals, pierce the dura mater, escape from the backbone, and ramify thence through the soft parts of the body. Eight pairs pass off in the region of the neck called the cervical nerves, 12 pairs are dorsal, 5 are lumbar, and 5 sacral, while the last pair comes off behind the coccyx. In its structure the spinal cord consists of gray and white matter. The gray matter, which is characterized by large cells, is gathered in the center into two crescent-shaped masses connected at the central part of the cord. The white matter, consisting mainly of fibers, is outside of and surrounds these gray crescents. In its functions the spinal cord forms a tract along which sensory impressions may pass to the brain, and along which motor impulses may travel to the muscles. It is besides a great reflex center. See Brain: Nerve: Spine.

Spinal Nerves, the name applied to the paired nerves which arise from the spinal cord, and which are distributed to the various parts of the body. The spinal nerves are so named in contradistinction to the cranial nerves, or those which originate from the brain itself. Thirty-one pairs of spinal nerves arise from the spinal cord of man. They pass from the spinal cord and spine through the intervertebral foramina, or openings between the bodies of the vertebræ. Eight pairs are cervical; 12 are dorsal nerves, also named thoracic; 5 are lumbar, 5 sacral, and 1 coccygeal. Each spinal nerve arises by two roots, an anterior and posterior, from the spinal column. The posterior root has a nerve mass or ganglion, which is wanting in the anterior. The fibers of the anterior roots are motor in nature, *i. e.*, impulses travel by these roots outward from the cord or brain to the body. The fibers of the posterior roots are sensory, *i. e.*, impulses are conveyed by these fibers to the cord or brain. The anterior and posterior fibers unite just beyond the nervous ganglion to form a single nerve trunk, in which the two sets of fibers are indistinguishable. See Nerve.

Spindle, in spinning, a pendent piece of wood for twisting and winding the fibers drawn from the distaff, or the pin used in spinning wheels for twisting the thread, and on which the thread, when twisted, is wound. It is applied also to a measure of yarn: in cotton a spindle of 18 hanks is 15,120 yards; in linen a spindle of 24 heers is 14,400 yards.

Spindler, Karl, a German novelist; born in Breslau, Silesia, Oct. 16, 1796. The best of his works are: "The Bastard" (3 vols. 1826); "The Jew" (4 vols. 1827); "The Jesuit" (3 vols. 1829); and "The Pensioner" (1831). The latter story is an excellent specimen of the early historical novel in Germany. It delineates the French Revolution and Napoleon's subsequent career. He died in Freiersbach, Baden, July 12, 1855.

Spindle Tree. See Euonymus.

Spindle Whorl, or **Spindle Whirl,** in archæology, a small perforated disk forming a rude fly wheel, formerly fixed on the spindle to maintain its rotary motion before the introduction of the spinning wheel. They are often met with in sepulchral chambers, and the oldest are probably of Neolithic age. A specimen was found at Holyhead.

Spine, the term applied to the backbone of a vertebrated animal, and so called from the thorn-like processes of the vertebræ. The human vertebral column is composed, in the child, of 33 separate pieces, but in the adult the number is only 26, several pieces having become blended together. These separate bones are arranged one on the top of the other, with a layer of gristle between each which helps to unite them, while this union is completed by partially movable joints and strong fibrous ligaments. The first 7 vertebræ, which are called cervical, occupy the region of the neck; 12 form the supports from which spring the ribs, and constitute the main portion of the back, being accordingly called dorsal; 5 in "the small of the back" are denominated lumbar; 5 pieces follow which, in the adult, unite to form the sacrum; and 4 which unite to form the coccyx. The vertebral column so arranged presents two forward curves, the first in the neck, the second at the lower part of the back; and two corresponding backward curves. The vertebræ differ in form according as they belong to the cervical, dorsal, or lumbar region, but they all have certain characteristics in common. Each possesses what is called a body, an arch which incloses a ring, and various projections and notches by means of which the bones are articulated. When the vertebræ are in position the rings are all situated one above the other, and so form a cavity or canal in which lies the protected spinal cord. The disease to which this bony struc-

ture is most liable is called angular curvature of the spine. Beginning with inflammation it goes on to ulceration (caries), till one or more of the vertebræ becomes soft and breaks down. The result of this is that the vertebræ are crushed together, the backbone bent, and a projection or hump gradually formed behind. The modern method of treatment is to apply to the patient's body, from the hips to the arm pits, a continuous bandage of plaster of Paris, which affords to the back a close-fitting support. Lateral curvature of the spine, unlike the former, is not so much due to disease of the column as to a relaxed condition of the body. It is most liable to attack young rapidly growing persons between the ages of 10 to 15. Treatment by plaster of Paris bandage may be necessary; but strengthening food, regular, moderate exercise, and cold bathing may prove sufficient to effect a cure.

Spine, in botany, a sharp process from the woody part of a plant. It differs from a prickle, which proceeds from the bark. A spine sometimes terminates a branch, and sometimes is axillary, growing at an angle formed by the branch or leaf with the stem. The wild apple and pear are armed with spines; the rose, bramble, gooseberry, etc., are armed with prickles. The term is applied in zoölogy to a stout, rigid, and pointed process of the integument of an animal, formed externally by the epidermis and internally of a portion of the cutis or corresponding structure.

Spinel, in mineralogy: (1) The type species of a group of minerals called the spinel group, crystallizing in the isometric system, and being compounds of protoxides and sesquioxides with the typical formula ROR_2O_3. (2) A mineral occurring in crystals of octahedral habit, and very rarely massive. Hardness, 8:0; sp. gr., 3.5–4.1; luster, vitreous to splendent, sometimes dull; color, many shades of red, also blue, green, yellow, brown, and black; sometimes nearly white, or colorless; transparent to opaque; fracture, conchoidal. Composition: When pure, alumina, 72.0; magnesia, 28.0 = 100, corresponding with the formula, $MgOAl_2O_3$; but the magnesia is often partly replaced by other protoxides, and the alumina by sesquioxides, giving rise to many varieties. Dana thus distinguishes them:

(1) Ruby or magnesia-spinel; with sp. gr. 3.52-3.58; (*a*) spinel-ruby, deep red; (*b*) balas-ruby, rose-red; (*c*) rubicelle, yellow or orange-red; (*d*) almandine, violet.

(2) Ceylonite, or iron-magnesia spinel = pleonaste, containing much iron; color, dark green to black.

(3) Magnesia-lime-spinel; color, green.

(4) Chlorospinel; color, grass-green, with the iron constituent as sesquioxide.

(5) Picotite, containing over 7 per cent. of oxide of chromium.

Spinello, Aretino, an Italian painter; born in Arezzo, Italy, about 1330, his father being a Ghibelline exile from Florence. The painter spent nearly all his life between his birthplace and his father's city. His principal frescoes were done for the sacristy of the church of St. Miniatus near Florence, for the *campo santo* (cemetery) of Pisa, and for the municipal buildings of Sienna (a series illustrating the Italian wars of Frederick Barbarossa), with several others in and near Arezzo. Spinello enjoyed a great reputation in his own day, being compared and by some preferred, to Giotto, whose style his own in some respects resembles. Unfortunately his frescoes have mostly disappeared; and his panel and easel pictures, of which there are several in the galleries of Europe, do not equal his frescoes in excellence. He died in Arezzo about 1410.

Spinet, in music, a musical stringed instrument resembling the harpsichord, and, like that instrument, now superseded by the pianoforte. Each note had but one string, which was struck by a quilled jack acted on by one of the finger keys. The strings were placed horizontally, and nearly at right angles to the keys; and the general outline of the instrument resembled that of a harp laid in a horizontal position, on which account the spinet, when first introduced, was called the couched harp.

Spinneret, in comparative anatomy, any one of the mammillæ projecting from the arachnidium in spiders. These mammillæ are little conical or cylindrical organs, four or six in number, through which the secretion of the glands of the arachnidium is passed and molded into a proper thread-like shape for the formation of a web or line. Also, a tubular organ in the labium of caterpillars communicating with two internal glands which furnish the silk from which the animal spins its cocoon.

Spinner, Francis Elias, an American financier; born in Mohawk, N. Y., Jan. 21, 1802; entered business and mercantile life, held various local offices in Herkimer, N. Y.; was auditor and deputy in the Naval Office, New York, 1845–1849, and was elected to Congress in 1854 as an Anti-slavery Democrat, being twice reëlected, serving till 1861; from 1861–1875 he was United States Treasurer, and handled the immense receipts and disbursements of the Civil War without the loss of a cent of the nation's money. He died in Jacksonville, Fla., Dec. 31, 1890.

Spinifex, or **Porcupine Grass,** the *Triodia irritans*, a very coarse, hard, and spiny grass which grows in tussocks, and in some interior parts of Australia covers hundreds of square miles at a stretch. This grass cannot be eaten by any animal, and as the clumps are three or four feet high they make exploring and traveling very laborious. Horses are badly lamed by the wounds from the spinifex.

Spinning, the art of combining animal and vegetable fibers into continuous threads fit for the process of weaving, sewing, or ropemaking. For the process, see COTTON: SILK.

Spinning Jenny, the name given by James Hargreaves to the spinning machine invented by him in 1767. The name jenny is a corruption of engine, the term gin being a common local expression for a machine. It consisted of a number of spindles turned by a common wheel or cylinder worked by hand.

Spinning Wheel, a machine for spinning wool, cotton, or flax into threads by the hand. It consists of a wheel, band, and spindle, has a distaff attached, and is driven by foot or by hand, usually the former, a treadle being employed. Before the introduction of machinery for spinning there were two kinds of spinning wheels in common use, the large wheel for spinning wool and cotton, and the small or Saxon wheel for spinning flax. See COTTON.

Spinola, Ambrosio, Marquis of, an Italian military officer; born in Genoa about 1569. He joined the Spanish forces in the Netherlands, and when the Archduke Albert of Austria had failed to reduce Ostend after a lengthy siege, he was superseded by Spinola, who was successful (1604). He was thereupon appointed Commander-in-Chief of all the Spanish and Italian forces in the Netherlands. During the following five years he frequently encountered Maurice, Prince of Orange, with no decisive results, and at length the war was finished by an armistice (1609). Spinola was next actively engaged in the Thirty Years' War. In 1620 he conquered the Lower Palatinate, and when the armistice with Holland was broken he invaded that country. He laid siege to Bergen-op-Zoom, from which he had to retreat; but in 1624 he invested and reduced Breda after 10 months' siege. This was his last great military achievement. He died in 1630.

Spinoza, Baruch, or **Benedict de Spinoza,** a Dutch philosopher; born in Amsterdam, Holland, Nov. 24, 1632. He was trained in Talmudic and other Hebrew lore by Rabbi Morteira; acquired a knowledge of Latin from the freethinking physician Van den Ende; came under the influence of the new philosophic teaching of Descartes; ceased to attend the synagogue; refused a pension offered by the rabbis for his conformity, and was expelled from the Israelitish community; fled from Amsterdam to the suburbs to escape the enmity of the fanatical Jews; removed from thence, after five years' seclusion, to Rynsburg, where he lived till 1663; subsequently went to Voorburg; and ultimately (1671) settled in The Hague. By his craft as a grinder of optical lenses he maintained a frugal position in the households of the friends with whom he lived. He refused a pension from the French king and a professorship in Heidelberg because their acceptance might hazard that high freedom of thought and conduct which was ever his jealous care; but he accepted a legacy from his friend De Vries. This annuity enabled him to devote a large part of his time to the study of philosophy. The first result of his labor was published anonymously in 1670 under the title of "Theological-Political Tract," and because it put forth a strong plea for liberty of speech in philosophy it was placed on the "Index" by the Catholics and condemned by the authorities in Holland. Such, indeed, was the storm which this treatise occasioned that the author himself published nothing further. After his death all his unpublished writings were conveyed to Amsterdam, and there the "Posthumous Works" was published (1677). In the "Ethics," therein included, his system of philosophy was developed; each of its five books being dignified by a series of axioms and definitions after the method of Euclid in his geometry. In all there are 27 definitions, 20 axioms, and 8 postulates; and the central conception of the whole system is that God, who is the inherent cause of the universe, is one absolutely infinite substance, of which all the several parts which we recognize are but finite expressions; that man, being but a part of this greater whole, has neither a separate existence nor a self-determining will; but that he can, by means of knowledge and love, so far control his passions as to enter into the joy which springs

BARUCH SPINOZA.

from this idea of an all-embracing God. He died Feb. 21, 1677.

Spinozism, the monistic system of Baruch Spinoza. It has been described as atheism, as pantheism, and as the most rigid monotheism, according as his cardinal teaching — that there is only one substance, God — has been interpreted. By substance, however, Spinoza meant the underlying reality and ever-living existence, and he chose for the epigraph of his "Ethics" the words of St. Paul: "In Him we live, and move, and have our being" (Acts xvii: 28). God is for him the one principle, having thought and extension as two eternal and infinite attributes constituting its essence, of which attributes mind and matter

SPIRÆA ARUNCUS.

are the necessary manifestations; and thus he solves the problem of the relation of the finite to the infinite. Everything is a form of the ever-living existence, the substance, God, which is, and is not, nature, with which He is no more to be confounded than the fountain with the rivulet or eternity with time. God is *natura naturans,* nature is *natura naturata;* the one is the energy, the other is the act. In the same way he explains the union of the soul with the body. Man is but a mode of the divine existence; his mind a spark of the divine flame, his body a mode of the infinite existence.

Spio, in zoölogy, the typical genus of *Spionidæ.* Body long, slender, tapering, with 60 joints, terminating in two short styles; head with long cirri and two very long tentacles; eyes four; color pale, with pink cirri. It occupies a very slender tube composed of adventitious matter, slightly agglutinated, and placed on sertularian zoophytes.

Spiracle, the name given to the apertures existing on the sides of the body in insects, centipedes, spiders, etc., and through which air is admitted to the breathing organs, which consist of air tubes. As commonly seen, each spiracle presents the form of a rounded or oval opening, the margin of which is formed by a horny ring. The opening itself may be closed by a kind of grating, and may be surrounded by delicate bristles or hairs. The name is also applied to the single nostril of the hag fishes, the blowhole of the cetaceans, etc.

Spiræa, a genus of plants, natural order *Rosaceæ.* The species, which are diffused through the temperate parts of the Northern Hemisphere, consist of small unarmed shrubs or perennial herbs, with simple or compound leaves and racemes or corymbs of white or reddish flowers. Several North American, Indian, and Japanese shrubby species are in cultivation. Two species are British, and are known by the name of meadow sweet.

Spiræin, a coloring mass extracted from the flowers of *Spiræa ulmaria* by ether; formula, $C_{30}H_{30}O_{14}$. It is a yellow crystalline powder, insoluble in water, soluble in alcohol and ether, the solutions being of a deep green color when concentrated, yellow when dilute. Its alcoholic solution forms a yellow precipitate with baryta water, crimson with lead acetate, dark green with ferrous salts, and black with ferric salts.

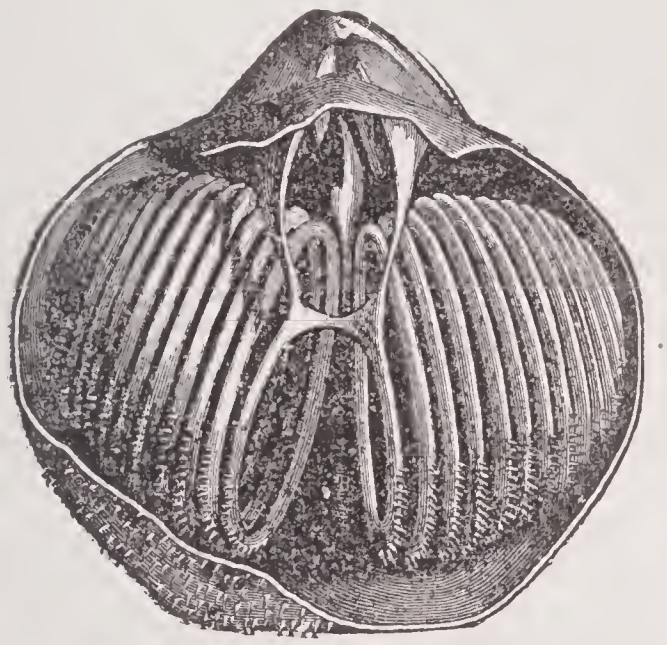
Spiral, in geometry, a curve which may be generated by a point moving along a straight line, in the same direction, according to any law, while the straight line revolves uniformly about a fixed point, always continuing in the same plane. The portion generated during one revolution is called a spire. The moving point is the generatrix of the curve, the fixed point is the pole of the spiral, and the distance from the pole to any position of the generatrix is the radius vector of that point. The law according to which the generatrix moves along the revolving line is the law of the spiral, and determines the nature of the curve. Any position of the revolving line, assumed at pleasure, is called the initial line. Spirals are known by the names of their inventors, or by terms derived from the properties by which they are characterized; as, the spiral of Archimedes, hyperbolic spirals, logarithmic spirals, parabolic spirals, etc. Also a helix or curve which winds round a cylinder like a screw.

Spiral Pump. See ARCHIMEDIAN SCREW.

Spiral Vessels, in botany, membranous tubes with conical extremities, their interior occupied by a fiber twisted spirally, and capable of unrolling with elasticity.

Called also tracheæ. They are designed for the transmission of air. When formed by the convolutions of a single spire they are called simple, when by those of many turning in the same direction they are called compound.

Spiral Wheels, in machinery, a species of gearing which serves the same purpose as bevel wheels, and is better adapted for light machinery. The teeth are formed on the circumferences of cylinders of the required diameter, at an angle with their respective axes, when the direction of the motion is to be changed. By this construction the teeth become in fact small portions of screws or spirals winding round the cylinders. Wheels of this kind are used when the two shafts require to pass each other; when the shafts are in the same plane bevel wheels are employed.



FOSSIL SPIRIFERA.

Spire, a very acute pyramid roof in common use over the towers of churches. The history of spires is somewhat obscure, but there is no doubt that the earliest examples of anything of the kind are the pyramidal roofs of the turrets of Norman date. Those of St. Peter's, Oxford, and Rochester Cathedral are good specimens of circular and octagonal pointed roofs, or spires in an embryo condition. Spires of this early period are much less acute than those of later date. The Early English style has spires of sharply pointed form over the larger towers. They are generally octagonal and what are termed broach spires — *i. e.*, the slopes spring from the cornice of the tower without any parapet, and at the point where the square changes to the octagon there is a small set-off or separate roof. Sometimes the angles at top of towers were occupied with pinnacles or sloping masses of masonry, as at Bayeux Cathedral, Normandy.

In the Decorated style the spires were more ornamented, having generally a parapet and pinnacles at the top of the tower, crockets on the angles, and enriched windows. The spires of the Perpendicular and Flamboyant styles are still more enriched, with flying buttresses at the angles, etc. They are sometimes perforated, and the sides of the spire filled entirely with tracery. Such spires are common in Germany, those of Strasburg and Freiburg on the Rhine being very fine examples, as also that of St. Stephen's, Vienna. As in the later styles generally, the character and beauty of the spire give place to dexterity in masonry, and many examples exist of traceried spires more wonderful than beautiful. Spires are more frequently constructed of stone, but they are also occasionally made of wood and covered with lead, copper, slates, or shingles. These are chiefly to be found in localities where stone is scarce. Among famous spires may be mentioned those of Ulm (530 feet), Cologne (515), Rouen (of cast iron, 487½), St. Nicholas, Hamburg (482), Strasburg (465), Chartres (371), and Salisbury (404), the highest in England, as St. Mary's Cathedral, Edinburgh (275), is the highest in Scotland, and St. Patrick's Cathedral, New York (328), in the United States. With these heights may be compared the Eiffel Tower (985 feet), the Washington obelisk (555), the Forth Bridge (361), and the domes of St. Peter's at Rome (330) and St. Paul's in London (215).

Spires. See SPEYER.

Spirifera, in palæontology, a genus of *Spiriferidæ,* with numerous species, beginning in the Lower Silurian and ending in

SPIRIFERA FROM ENGLISH LIAS.

the Permian, or, according to Woodward, ranging into the Triassic. Shell impunctate, valves articulated by teeth and sockets; hinge line long and straight, hinge area divided across in each valve by a triangular fissure (in the ventral valve closed, partially or completely, by a pseudo-deltidium,

in the dorsal occupied by the cardinal process). Woodward reckons three sub-genera: *Cyrtia*, *Suessia*, and *Spiriferina*.

Spiriferidæ, in palæontology, a family of *Brachiopoda*, ranging from the Lower Silurian to the Lias. Animal free when adult, or rarely attached by a muscular peduncle; the shell punctated or non-punctated; arms greatly developed, and entirely supported upon a thin, shelly, spirally rolled lamella. Woodward enumerates four genera, to which Tate adds eight others.

Spirit, an immaterial intelligent substance or being; vital or active principle, essence, force, or energy, as distinct from matter; life or living substance considered apart from material or corporeal existence; as, the soul of man, as distinguished from the body wherein it dwells. Hence, a ghost; a specter; a supernatural apparition or manifestation; also, sometimes, an elf; a fay; a sprite. Also, real meaning; intent; in contradistinction to the letter or to formal statement; and characteristic quality, particularly such as is derived from the individual genius or the personal character; as, the spirit of the law.

In chemistry, a name generally applied to fluids, mostly of a lighter specific character than water, and obtained by distillation. Thus, the essential oil of turpentine is called spirit of turpentine. Essential oils dissolved in alcohol are called spirits, as spirit of aniseed, peppermint, etc., because formerly prepared by distilling the herbs with alcohol. The volatile alkali ammonia, distilled and condensed in cold alcohol, is called spirit of ammonia; even hydrochloric acid is often called spirit of salts. But in a stricter sense the term spirit is understood to mean alcohol in its potable condition, of which there are very numerous varieties deriving their special characters from the substances used in their production, as brandy, rum, whisky, gin, arrack, etc.

In theology, the Spirit, or Holy Spirit, the Holy Ghost; the Spirit of God, or the third person of the Trinity. The spirit also denotes the human spirit as animated by the Divine Spirit. Rectified spirit, proof spirit made pure by distillation.

Spirit Level, an instrument used for determining a line or plane parallel to the horizon, and also the relative heights of two or more stations. It consists of a glass tube nearly filled with alcohol, preferably colored. The remaining space in the tube is a bubble of air, and this occupies a position exactly in the middle of the tube when the latter is perfectly horizontal. The tube is mounted on a wooden bar, which is laid on a beam or other object to be tested; or it is mounted on a telescope or theodolite, and forms the means of bringing these instruments to a level, the slightest deviation from the horizontal position being indicated by the bubble rising toward the higher end of the tube. Spirit level quadrant, an instrument furnished with a spirit level and used for taking altitudes.

Spiritual Corporations, corporations where the members are entirely spiritual persons, and incorporated as such for the furtherance of religion and perpetuation of the rights of the Church. They are of two kinds: Sole, as bishops, certain deans, parsons, and vicars; and Aggregate, as deans and chapters, prior and convent, abbot and monk.

Spiritualism, the term used in philosophy to indicate the opposite of materialism, and the belief in the existence and life of the spirit apart from, and independent of, the material organism, and in the reality and value of intelligent intercourse between spirits embodied and spirits disembodied. The belief in spirit manifestations has long obtained, but in its limited and modern form spiritualism dates from the Fox sisters in 1848 (see FOX-KANE, MARGARET). In this year a Mr. and Mrs. Fox, who lived with their two daughters at Hydeville, N. Y., were disturbed by repeated and inexplicable rappings throughout the house. At length it was accidentally discovered by one of the daughters that the unseen "rapper" was so intelligent as to be able to reply to various pertinent questions, and so communicative as to declare that he was the spirit of a murdered peddler. When this discovery was noised abroad a belief that intercourse could be obtained with the spirit world became epidemic, and numerous "spirit circles" were formed in various parts of America. The manifestations thus said to be received from the spirit were rappings, table turnings, musical sounds, writings, the unseen raising of heavy bodies, and the like. These lower manifestations of spiritualism are said to be given to the nonbeliever as evidence that the facts on which the spiritualistic beliefs are based are realistic. Part of the peculiarity of these phenomena was that they were always more or less associated with a medium, who was supposed to have an organization sensitively fitted to communicate with the spirit world. Mediums are usually persons who see visions and hear voices, and show evidence of their power even in childhood. One of the most noted mediums in England was the Rev. William Stainton Moses, who died in 1892. The first professional medium who visited Europe was a Mrs. Hayden, and she was followed in 1855 by Daniel D. Home, who visited nearly all the courts of Europe. He claimed to possess unusual powers, and was said to be able to float up to the ceiling or out of the window into the next room. Such claims not only attracted the curious

and converted the unthinking, but also received the attention of legal and scientific men. In America, Judge Edmonds and Professor Hare undertook to expose their fallacy, but both had to admit the genuineness of some of the evidence; while in England such eminent converts as A. R. Wallace, W. Crookes, F. R. S., and Professor De Morgan were inclined to put their credence in the truth of the phenomena. The London Dialectical Society appointed a committee to investigate the phenomena, and the report (1871) admits the genuineness of the phenomena, but does not seek to explain their origin. In the United States, the believers in spiritualism are very numerous, and have many newspapers, magazines, and books to explain and enforce their belief. In 1884 the London Spiritualist Alliance was founded, and was incorporated in 1896. The chief work of the society has been to maintain and expound the principles of spiritualism. There are local organizations in almost all towns of any importance.

The Belief.— The popular belief seems to be that the phenomena of spiritualism are the result either of self-delusion on the part of believers, unconscious deception on the part of the medium, or clever conjuring. The more recent investigations of the Psychical Society seem to show that there are forces connected with hypnotism and its kindred phenomena which may explain the occult occurrences of spiritualism on natural, though hitherto little known, laws. The belief of spiritualism is that our existence in this world is but one stage in an endless career; that the whole material world exists simply for the development of spiritual beings, death being but a transition from this existence to the first grade of spirit life; that our thoughts and deeds here will affect our conditions later; and that our happiness and progress depend wholly on the use we make of our opportunities and faculties in this plane. Among spiritualists are found persons of every belief, from the Roman Catholic to the Unitarian, as it does not modify the creeds or dogmas of any sect. In France is a class of spiritualists who believe existence of the soul is alternating spirit life and reincarnation.

Spiritus, in grammar, a breathing, an aspirate; applied to two marks in Greek grammar. *S. asper* (literally = a rough breathing) (ʽ) placed before certain words beginning with a vowel to indicate that they are to be pronounced like words beginning in English with an aspirated *h*. Also, placed over the initial letter *Rho*, the equivalent of the English *r*, it interpolates an *h* and the *r* then become *rh;* and *S. lenis* (literally = a smooth breathing) (ʼ), denoting the absence of any aspirate.

Spirometer, an instrument for measuring the capacity of the chest. It consists of an inverted chamber submerged in a water bath. The breath is conducted by a flexible pipe and internal tube, so as to collect in the chamber, which rises in the water. An index is attached to the chamber, and is graduated on its face, so as to indicate against the edge of the index case the cubic inches of air expired.

Spirula, a genus of cuttle fishes or cephalopods, comprising only three known species, so named from their very delicate shell being rolled into a spiral form. The shells are very numerous on the shores of New Zealand, but the animal forming them is extremely rare, being seldom found except in a fragmentary state.

Spirulirostra, in palæontology, a genus of *Sepiadæ*, with one species, from the Miocene of Turin. Only the mucro is known; chambered internally, chambers connected by a ventral siphuncle, external spathose layer produced beyond the phragmocone into a long pointed beak. Spirulirostra forms a connecting link between *Spirula* and the fossil *Belemnites*.

Spithead, a roadstead on the S. coast of England, and a favorite rendezvous of the British navy; is the E. division — the Solent (*q. v.*) being the W. — of the strait that separates the Isle of Wight from the mainland. It is protected from all winds, except those from the S. E., and its noted security warranted the name which has been applied to it by sailors of the "king's bedchamber." It receives its name from the "Spit," a sandbank stretching S. from the Hampshire shore for 3 miles; and it is 14 miles long by about 4 miles in average breadth. Spithead has been strongly defended since 1864 by fortifications completing those of Portsmouth.

Spitz, or **Pomeranian Dog,** the result of a cross from the Eskimo dog, the native dog of the Arctic regions. The spitz is about the size of the spaniel, with a sharp-pointed face and an abundant white coat sometimes of great beauty. Other colors are known, including black. It is comparatively common in the United States, where it is a favorite dog with Germans.

Spitzbergen, a group of three large and several small islands in the Arctic Ocean; between lat 76° 30′ and 80° 40′ N.; lon. 9° and 22° E.; nearly equidistant between Greenland and Nova Zembla, the largest being West Spitzbergen and Northeast Land. Very little is known of their interior, but the coasts have been repeatedly explored, and present immense glaciers and mountain chains, some of which exceed 4,000 feet in height. The climate is intensely cold; and vegetation is confined to a few plants of rapid growth. For four

months in winter the sun is below the horizon, and for an equal period in summer the sun is always above the horizon. The larger forms of animal life are foxes, bears, and reindeer, while sea fowl are numerous. The minerals are known to include marble and good coal. The group appears to have been discovered in 1553 by Willoughby, the English navigator, and was again visited in 1596 by the Dutch navigator Barentz in endeavoring to effect a N. E. passage to India. Among the later explorers are Leigh Smith, Nordenskjöld, Andreasen, Johannesen, Nansen, and Svordrup.

Spizaëtus, in ornithology, a genus of *Aquilinæ*, with 10 species, from Central and South America, Africa, India, and Ceylon to Celebes and New Guinea, Formosa, and Japan. Beak convex above, nostrils elliptical; tarsi elevated, rather slender; acrotarsia scutellated; toes rather short, claws acute. It corresponds with the *Morphnus* of Cuvier.

Splachnei, or **Splachnaceæ,** a tribe of acrocarpous operculated mosses growing in tufts, especially upon dung. Stem loosely leaved; peristome, if present, of lanceolate rufescent, rather fleshy teeth; capsule straight, on an apophysis; spores radiating in lines from the columella.

Splachnum, gland-moss; the typical genus of *Splachnei*. Fruit-stalk terminal; calyptra conical, entire or slit; peristome of 16 teeth, columella generally emerging, capitate; apophysis large, often umbrella-shaped. *S. ampullaccum* is common on rotten cow dung.

Splanchnopleure, in embryology, a term applied to the lower lamina of the mesoblast, forming the walls of the intestines, the outer, or upper lamina, which is called the somatopleure, forms the walls of the body. These words are used in analogous senses in comparative anatomy.

Spleen, one of the abdominal glands at the left side of the body, close to the stomach and pancreas. It is somewhat oval-shaped and concave internally, where it is divided by a fissure named the ilium. Here blood-vessels enter and leave the organ, and the nerves also enter. The upper extremity of the spleen is thick; the lower, which is in contact with the colon, is more pointed. The average length of the spleen is 5 inches, its breadth 3 or 4 inches, and its thickness 1 or 1½ inches. Its weight is about seven ounces. The spleen is a meshwork of fibers or trabeculæ, supporting a soft matter named the spleen pulp. Microscopically examined, the latter is found to consist of blood corpuscles in a state of disintegration. The spleen substance also includes certain small round bodies, attached to the sheaths of the blood-vessels of the spleen, and named Malpighian or splenic corpuscles. During digestion the spleen increases in size, but under starvation it decreases, and the Malpighian bodies disappear. The spleen is supplied with blood by the splenic artery; its nerves are derived from the right pneumogastric nerve, and from the left semilunar ganglia. This organ may be excised from man and other animals without impairing the health, hence we may conclude that its functions are capable of being carried on by some other glands. In all probability the spleen is one of the blood glands, of which the thymus and thyroid glands, and indeed the whole lymphatic system, are examples. In the spleen the blood corpuscles undergo some changes; possibly the organ may be the seat of manufacture of red blood corpuscles, as well as of their final disintegration.

Diseases of the Spleen.— Most of the diseases of the spleen occur as secondary affections in connection with other diseases, such as ague and leucocythæmia. Amyloid degeneration of the spleen is frequently associated with a similar disease in the liver or kidneys. The spleen is enlarged and increased in density, and it feels to the touch like wax. Splenitis or inflammation of the spleen is rare in this country, but is common in tropical malarial districts, and is usually associated with ague. The symptoms are pain in the left side, in the hypochondriac region, and considerable tumefaction. The hypertrophied spleen may encroach on the stomach, and by upward pressure disturb the heart's action, or it may extend downward into the pelvic region. The diffuse inflammation may terminate by resolution, but pus may form or the spleen may become gangrenous. Tumefaction generally subsides rapidly; but more or less hypertrophy may remain. Atrophy of the spleen is a much less frequent affection.

Treatment.— Splenitis being generally associated with ague disappears, as a rule, when the ague is cured. When the spleen is chronically enlarged, it is best treated by the internal administration of the iodide of potassium, and by rubbing into the skin over the spleen the red oxide of mercury in the form of ointment.

Spleenwort, the common name of various ferns of the genus *Asplenium*. These plants were so named because they were supposed to remove disorders of the spleen. They grow in rocky woods.

Splendor, in heraldry, a term applied to the sun when represented with a human face, and environed with rays.

Splenic Fever, in animal pathology: (1) A contagious and malignant disease of the blood, most common in cattle, but communicable to all domestic animals and even to man. Known also as anthrax, black

quarter, black leg, black tongue, bloody murrain, and quarter ill. (2) A disease affecting herds of cattle in the low swampy lands of Southern Texas. It closely resembles the rinderpest, and is sometimes called the Spanish fever.

Splice. See KNOTS.

Splint, or **Splent,** a bony enlargement on a horse's leg, between the knee and fetlock, usually appearing on the inside of one or both fore legs, frequently situated between the large and small cannon bones, depending on concussion, and most common in young horses that have been rattled rapidly along hard roads before their bones are consolidated. When of recent and rapid growth the splint is hot and tender and causes lameness, especially noticeable when the horse is trotted along a hard road. A piece of spongio-piline saturated with cold water should be applied to the splint, kept in position with a light linen bandage, and wetted with cold water or refrigerant mixture every hour. Perfect rest must be enjoined for 10 days or a fortnight. When the limb is cool and free from tenderness, the swelling, which will still remain, may be greatly reduced by some stimulating applications, such as the ointment of the red iodide of mercury, the common fly blister, or the firing iron.

Splint, in surgery, a mechanical contrivance for keeping a fractured limb in its proper position, and for preventing any motion of the ends of the broken bone; they are also employed for securing perfect immobility of the parts to which they are applied in other cases, as in diseased joints, after resection of joints, etc.

Ordinarily splints are composed of wood carved to the shape of the limb, and padded; the best pads being made out of old blankets, which should be cut into strips long and wide enough to line the splints, and laid in sufficient number upon one another to give the requisite softness. The splints should be firmly bound to the limb with pieces of bandage, or with straps and buckles; care being taken that they are put on sufficiently tight to keep the parts immovable and to prevent muscular spasm, but not so tight as to induce discomfort. Gutta-percha, sole leather, or pasteboard, after having been softened in boiling water, may in some cases advantageously take the place of wooden splints. They must be applied when soft to the part they are intended to support, so as to take a perfect mold, and then be dried, stiffened, and, if necessary, lined. Perforated tin or zinc is sometimes used to form splints. An account of the more complicated kinds of splint required in certain cases, as Macintyre's splint, Liston's splint, etc., may be seen in any illustrated catalogue of surgical instruments.

The ordinary splint is now to a great degree superseded by immovable bandages, which consist of the ordinary bandage saturated with a thick mucilage of starch, with glue, or with water glass (a solution of silicate of soda). As, however, these bandages require some hours to dry and become rigid, means must be used to counteract any displacement of the limb in the interval. On this account many surgeons prefer the plaster of Paris or gypsum bandage, which is applied in the following manner: The limb being protected by a layer of cotton-wool, a bandage composed of coarse and open material, into which as much dry powdered gypsum as possible has been rubbed, must be immersed in water for about a minute, and then rolled around the limb in a spiral manner, just as an ordinary bandage; after every second or third turn of the bandage, the left hand of the surgeon should be plunged into water, and smeared over the part last applied. When the whole has been thus treated, the exterior of the bandage should be smeared over with a paste of gypsum and water till a smooth surface and complete rigidity have been attained — a process not occupying more than 10 minutes or a quarter of an hour.

Splint Armor, a name given to that kind of armor which was made of several overlapping plates. It never came into very general use, because the convexity of the breastplate would not allow the body to bend unless the plates were made to overlap upward, and this rendered them liable to be struck into and drawn off by the weapon of an antagonist.

Splügen, an Alpine pass in the Grisons, Switzerland; at an altitude of 6,946 feet; connects the valley of the Farther Rhine with that of a tributary of the Adda; and has been used for crossing the Alps since the time of the Romans. The existing road, 24 miles long and 14½ feet wide, was made by the Austrian government in 1812–1822. It is protected against avalanches by several galleries and refuges.

Spodiosite, a rare mineral occurring in prismatic crystals of the orthorhombic system in Wermland, Sweden; hardness, 5.0; sp. gr., 2.94; luster dull, vitreous; fracture, uneven. Eliminating impurities, it is essentially a calcium phosphate and fluoride. Dana suggests that it may be pseudomorphous.

Spodumene, a monoclinic mineral occurring in granites, sometimes, as in the United States, in large but well-defined crystals. Prismatic cleavage very perfect and easily obtained; hardness, 6.5 to 7; sp. gr., 3.13 to 3.19; luster, pearly, in some parts vitreous; color, shades of green to emerald-green, grayish-white; transparent

to sub-translucent; fracture, uneven. Composition: Silica, 64.2; alumina, 29.4; lithia, 6.4 = 100, corresponding with the formula, 3RO, $3SiO^2 + 4Al^2O^3, 3SiO^2$. A crystal found at Norwich, Mass., was 16½ inches long, and 10 inches in girth.

Spofford, Ainsworth Rand, an American librarian; born in Gilmanton, N. H., Sept. 12, 1825. He was a journalist to 1861, when appointed chief assistant librarian of the Congressional Library, and was librarian in 1864-1897, when he became again chief assistant. He was famed for a comprehensive and accurate knowledge of books and their contents, and besides many essays and articles on historical, literary, and scientific subjects for the current journals, published: "The American Almanac," for several years; and, with others, edited "Library of Choice Literature" (10 vols. Philadelphia, 1881—1888); "Library of Wit and Humor (5 vol. 1884); and "A Practical Manual of Parliamentary Rules" (1884); and wrote "A Book for All Readers" (1900). Died Aug. 11, 1908.

Spofford, Harriet Prescott, an American authoress; born in Calais, Me., April 3, 1835; was graduated at the Pinkerton Academy in Derry, N. H., in 1852. In 1859 she published "In a Cellar" in the "Atlantic Monthly." This story made her reputation, and thereafter she became a regular contributor to the chief periodicals of the country. Among her publications are: "Sir Rohan's Ghost," "The Amber Gods," and other stories; "New England Legends," "Hester Stanley and St. Marks," "A Master Spirit," etc.

Spohr, Louis, a German composer; born in Seesen, Brunswick, April 5, 1784; was at first a violin player in the private band of the Duke of Brunswick. His reputation commenced with the year 1804, upon the occasion of his traveling over Germany and giving concerts. After a course of travel in Italy, he was, in 1818, appointed director of music at the theater at Frankfort-on-the-Main. About this time he commenced writing those operas which made his name famous throughout Europe. The most popular of these works are "Azor," "Faust," "Zemira," and "Jessonda." On leaving Frankfort, he was appointed chapel-master to the Grand-Duke of Hesse-Cassel. His "Violin School" is one of the best works of the kind which has ever been written. He also produced oratorios, songs, ballads, cantatas, and orchestral pieces, which are highly esteemed in Germany. He died Oct. 22, 1859.

Spokane, (spō̆h-kan′), city, and the county-seat of Spokane co., Wash. It is on the Spokane river, which plunges through the center of the town in a series of three cascades, falling 132 feet in a quarter of a mile, and in 1¼ miles 150 feet. The lines of the Northern Pacific, the Great Northern, the Oregon R. R. and Navigation co. (Union Pacific System), 8 local branch railroads and one electric line meet here, giving an unrivaled connection with the surrounding region and with distant points. Eastern Washington, northern Idaho, northern Montana, northeastern Oregon, southeastern British Columbia—a vast territory of incalculable wealth in agricultural and mineral resources—serves and is served by Spokane.

History.—The first settlement was made here in 1872; in 1876 the first flour and lumber mill, and in 1879 the first bank and the first newspaper were established, although even in 1880 there were but 350 inhabitants in Spokane Falls, as it was called. In 1881 the Northern Pacific Railroad entered the town which then began to grow, and, with its 500 people, was incorporated, while another mill and another paper started up. In 1882 it was made the county-seat. In 1883 there was a destructive fire, followed in 1889 by another, which, however, resulted in a rebuilding of the town in substantial style, the population having grown to 19,222 and the tributary railroads increased to eight by 1890. In 1893 came a financial panic and widespread bankruptcy, consequent on a real estate speculative "boom" that arose in the era of rebuilding and new hope. But that passed, and the pouring in of people, business from the surrounding country and money from all quarters, reëstablished credit and confidence, and wholesome growth ensued.

Local Features.—The situation of Spokane is picturesque in the extreme. It is in the midst of marvellous scenery in mountain and forest, lake and river, and within easy reach of summer resorts of beauty and interest visited by increasing numbers of tourists. The climate in this sheltered valley gives cool summers and mild winters. Within, despite its irregular surface, the city is regularly laid out on a rectangular plan of N. and S., E. and W. streets. The residential portion is on the high land and contains many beautiful dwellings, some of them inhabited by the "mining kings" of Idaho, the mines of which State are largely owned in Spokane. The business part of the city is along the lower stretch of the river, where the great water-power of the falls is turned to work. At low stages of water the minimum available energy is reckoned at 33,000 horse power, of which about 15,000 is developed and in use, partly in the form of producing electric power. This lights the city, runs mills and factories, operates 74 miles of street railways and 45 miles in the suburbs; it is leased to manufacturers on the Niagara scale of charges, while the simple water power is let at $10 per horse power per annum. Electric power from this plant is furnished to the famous Cœur d' Alène silver-lead mines, 100 miles

Spokane

away in Idaho, which produce about one-fifth of all the lead of the world. From Post Falls, 22 miles E. of Spokane, to the confluence with the Columbia, 60 miles W., there is a total fall of 1,269 feet; and from estimates by competent engineers the river is stated to be capable of producing, by means of dams, 400,000 horse power. The water works, owned by the city, with 126 miles of mains, cost $1,776,741, and yield an annual income of $247,000; and this fine water and the perfect natural drainage give conditions which make credible the remarkably small death-rate of 10.5 per 1,000 of population. The buildings of the city are mostly fine, and many of them quite unusually large and substantial for so new a community to build. The Federal Building (Spokane is a sub-port of entry, and has its bonded warehouse and government offices for Division Postal Inspection, etc.), the city and county edifices, the 22 public school buildings (costing $1,250,000), especially the High School ($175,000), the Gonzaga College (R. C.), Masonic Temple, "Spokesman-Review" (newspaper), Empire State (office-building), Auditorium (theater), various club houses, two cathedrals (R. C. and Prot. Epis.), Public Library (Carnegie), armory, convention-hall, and other handsome buildings are clear evidences of enterprise and prosperity. The business houses and blocks give a notably solid and permanent look to the streets. There are 8 theaters, and 56 churches, representing nearly all denominations. The bridges that cross the river number 23; one is a cantilever, of 1,210 feet. The Federal government maintains here an important military post in Fort Wright, on 1,022 acres of land given by the city. Several fine parks (five public, four private) add to the attractions of the town. The public institutions of charity—two hospitals, several homes for children, the friendless, etc.—and a sufficiency of private societies in aid of such objects, care for the unfortunate poor. The city maintains three daily newspapers, 11 weeklies and 12 monthly periodicals, and is in all ways well equipped for its active labors.

Manufactures.—Naturally, the lines of industry in Spokane are largely affected by the peculiar needs and products of the agricultural and mining region in the midst of which it stands. The great forests make lumber mills a necessity. The output of lumber in 1905 was 750,000,000 feet, of which 20,000 carloads were sent east. North of the city are fine quarries of granite and marble. The Columbia river basin of 60,000 square miles (nearly as large as New England) produces small grain and fruits, but wheat is the principal farm product, the average yield per acre being greater than in any other section of the world except New Zealand; and grain-elevators, flour mills and flour mill machinery-making flourish in Spokane (the flour product in 1905 was 450,000 barrels). Iron works, machine shops, factories for brick and terra cotta, sewer and water pipes, pottery, furniture, cereal foods, vinegar and pickles, jewelry and personal attire, house-furnishing goods, dairy products, canned goods, agricultural implements, mining tools, etc., are all to be found here, driven either directly or electrically by the magnificent water power which pulses through the heart of the town. The capital invested in 1900 was $2,678,823; the annual wage-payment, $1,080,618; and its manufactured product, nearly five and a half millions of dollars; but in 1905 it was estimated that the establishments had increased nearly five-fold, with invested capital of $12,000,000.

Commerce.—"The Eastern gateway to the great Northwest," a writer has called Spokane; "the largest city from the Mississippi to Puget Sound." Certainly a great commerce has begun passing this gate-way and more is to follow. Besides the railroad lines mentioned above, others are under way: one electric road to the wheat country of the Palouse river, 95 miles distant; another 16 miles to Medical Lake, famous for its curative salty waters; another to the "Big Bend" country, a famous agricultural district, and still another 46 miles to Lake Pend d' Oreille, Idaho. A steam road runs 145 miles up into British Columbia to a connection with the Canadian Pacific at Yahk. The wheat passing through Spokane is 40,000,000 bushels a year; the fruit in 1905 was 7,632 carloads, worth $2,500,000, and in the fruit district eight million trees were planted in that year; the forests of pine in the near vicinity cover an area greater than any other extent of this most useful wood, and the lumber trade must expand; seven million dollars in dairy products, 20,000 carloads of live stock, etc.—in all, nearly thirteen million dollars' worth of farm products in a year. Like the mining regions, the agricultural counties about Spokane are given to specialties. Adams, Douglas, Franklin, Lincoln, Spokane, Walla Walla and Whitman counties are famous for wheat. Benton, Chelan, and Yakima counties for root-crops, peaches, and winter apples renowned for size and flavor; Stevens and Okanogan counties for grazing, dairying, and fine cherries. Much of all this is distributed to the surrounding States, and much goes on west through Seattle and Puget Sound to the Orient. The choicest winter apples find a ready market in cities of the eastern United States. The irrigation, fine climate, and wonderful soil (a volcanic ash) of these regions and the not distant mining resources tributary to Spokane put

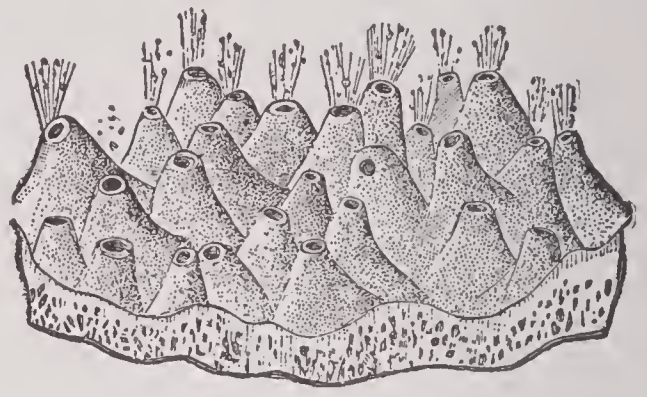
forth at least 27 millions in gold, silver, lead and copper per annum, will keep her manufacturers, railroads and shippers increasingly busy.

Municipal Interests.—The government of Spokane is lodged in a biennially elected mayor, a city council (one chamber) and a board of public works appointed by the mayor. The assessed valuation of taxable property in 1900 was $19,500,000, and in 1905, $27,065,384. The bonded debt was $1,630,000; the annual expenditure, including interest, etc., $660,000. The tax rate in 1905 was 37 mills on a very moderate valuation. The disasters of the high ratings in the time of the "boom" taught a wholesome lesson; and, while in 1892 the town valued its property for taxation at 38 millions, in 1905, with vastly more real value, the assessed valuation is only 27 millions. The public schools receive $450,000 (aside from municipal expenses) and the city spends $8,500 in maintenance of the public library. The financial institutions are 10 banks, 4 being national (capital $1,400,000, surplus $1,000,000, deposits $16,500,000) and the other branches, savings banks, loan and trust companies, building societies, etc. The clearances for 1905 were $164,099,442 (a gain of 33% over 1904). In every element, the condition of Spokane is healthful growth. From 1900 to 1905 inclusive, over 8,000 buildings were erected at an estimated cost of $14,037,596, or $20,000,000 actual value. Pop. (1900), 36,848; (1910) 104,402.

L. G. Monroe.

Spondias, in botany, the typical genus of *Anacardiaceæ*. Leaves alternate, without dots; carpels surrounded by a cup-shaped disk, and five in number, each one-celled with a pendulous seed. The fruit of various West Indian and South American species, as *S. purpurea* and *S. mombin*, are eaten, so is that of *S. dulcis* or *cytherea* (the Otaheite apple) in the Society Islands. The great fleshy kernel of *S. birrea* is eaten in Abyssinia. An intoxicating drink is manufactured from it by the negroes of Senegal. The bark of *S. venulosa* is an aromatic astringent given in diarrhœa, etc. The juice of the fruit of *S. tuberosa* is drunk in Brazil in fevers. A species, *S. mangifera*, called by Anglo-Indians hog plum, grows in India. The pulp is given in bilious dyspepsia, the bark as a refrigerant. It is also used in dysentery, and the juice of the leaves in earache. The gum is somewhat like gum arabic, but darker.

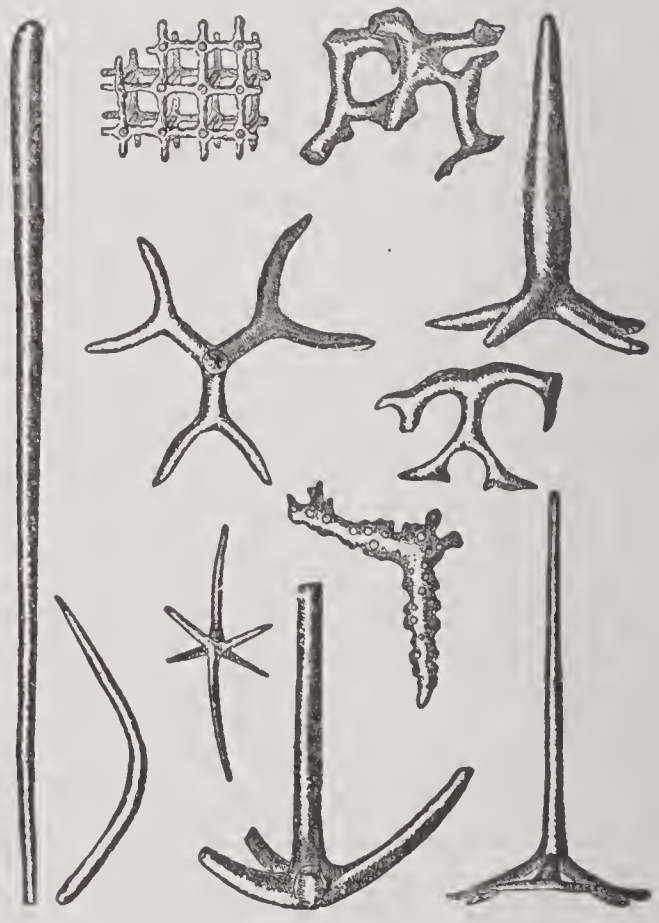
Sponge, *Spongida*, a horny substance valued for its ready imbibition of water and consisting of the keratode skeleton of certain Protozoa or lowest animals. A sponge is thus a colony of living animals. Such a colony communicates with the outer world by means of certain openings (capable of being closed at will), traceable in an ordinary sponge, and of which the larger are named oscula and the smaller pores. By the latter, currents of water are continually drawn into the sponge, while through the oscula currents are as continually discharged. These currents are kept up through the action of the minute vibratile processes named cilia, which are limited usually to certain spaces of the canals



SPONGE IN ACTION
Surface highly magnified.

named ciliated chambers. The main use of this circulation is evidently nutritive.

Sponge reproduction is effected by means of specially developed masses of protoplasm named spores, which are formed in autumn, and which on liberation in spring are found to contain small reproductive particles, which after a free existence de-



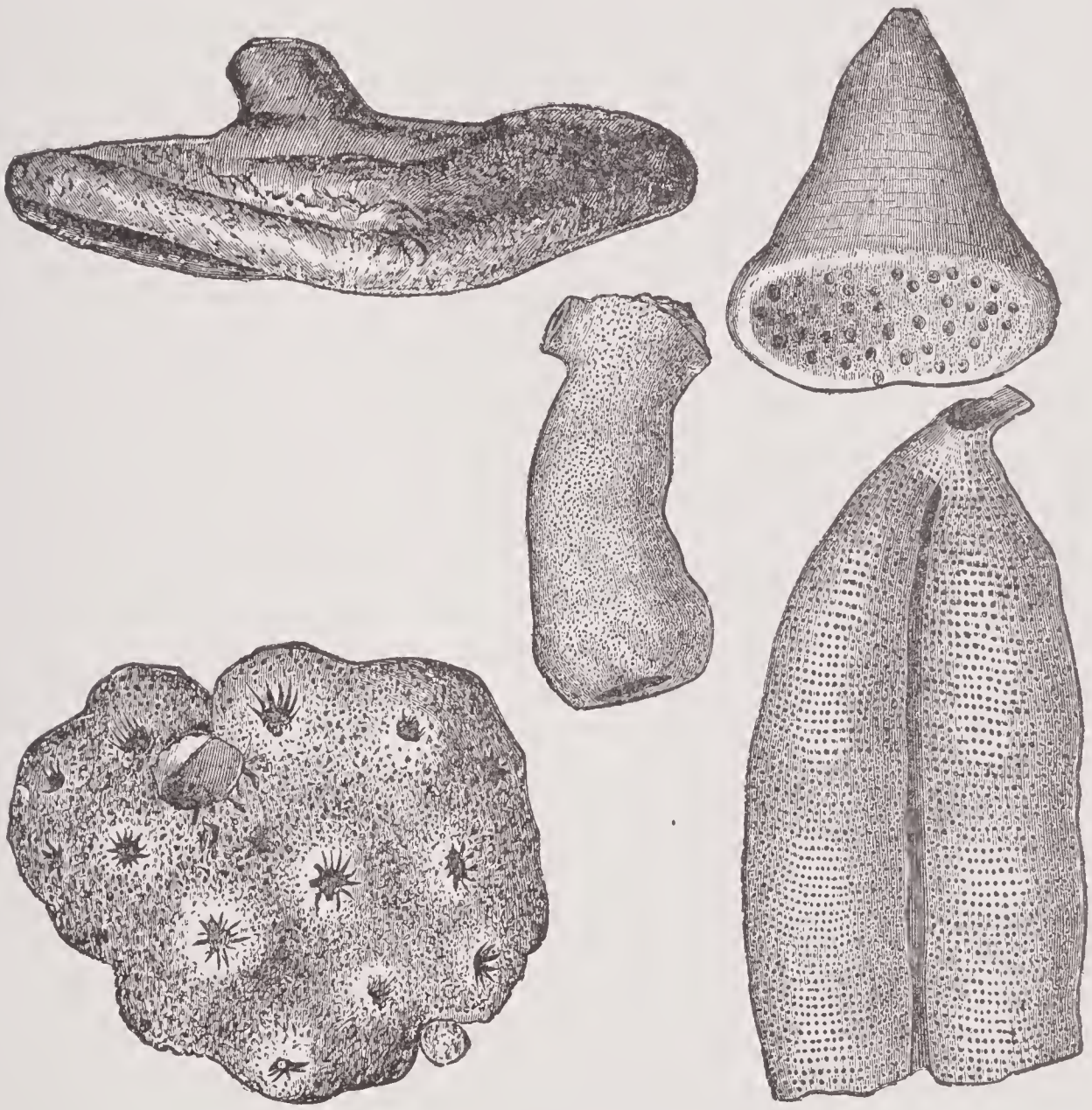
SPONGE SKELETONS

velop into sponges. Sexual reproduction is represented by the union of certain cells representing ova or eggs, and other cells representing spermatozoa. After fecundation of sponge-egg undergoes the stages of segmentation common to the developing eggs

Sponge

of all animals, till the morula or mulberry stage is reached. Thereafter the egg becomes elongated and swims freely about in the water. An internal cavity is next formed, this cavity communicating by a mouth externally, and being bounded by two layers (ectoderm and endoderm). In this stage the young sponge is a gastrula. Latterly the outer cilia disappear, internal cilia are developed, and the sponge ultimately fixes itself, and circulation is established. Sponges are classified either as the keratosa (horny), silicea (flinty, *e. g.*, "Venus's flower basket," or euplectella), and calcarea (*e. g.*, sycon). A more philosophical arrangement divides the sponge class into families: (1) *Fibrospongiæ* (fibrous, including silicea); (2) *Myxospongiæ* (*Halisarca*); *Calcispongiæ* (*e. g.*, sycon and calcareous generally). Fossil sponges are of frequent occurrence.

The sponges of commerce come from the Eastern Mediterranean Sea, the West Indies, and the coasts of Florida. In the Archipelago, Crete, Cyprus, on the coasts of Asia Minor, Syria, Barbary, and the Bahama Islands, sponge fisheries constitute a very important industry. The finest sponges are obtained in Turkish waters. The fishing season commences in May and closes in September or October. Diving is practised, and is carried on in a rude, primitive manner. The diver, who has no dress, seizes hold of a large stone, to which a line is attached, and sinks by means of it to a depth varying from 30 to 180 feet. Keeping hold of the rope, he tears the sponge off the rocks within his reach, and places it in a net; when he has secured a netful he signals by means of the rope to be drawn up. A diver usually remains under water from 40 to 60 seconds. Formerly all the sponges gathered in the Archipelago were sent to Smyrna for transhipment to England and the Continent, but now many cases of sponge are shipped direct from the islands. Sponges of a coarse texture and large honeycombing is found all along the coast of Tripoli and Tunis. The West Indian trade is annually increasing, and the fishing industry gives employment to 500 vessels and 2.000 persons. The Bahamas and the coast of Florida are the best fishing grounds. The qualities most in commercial demand are "wool," "reef," and "velvet"; the other kinds go by the names of "boat," "silk"



FOSSIL SPONGES OF THE JURA PERIOD.

Sponge

or "glove," "grass," "hardhead," "mixed," "yellow," and "refuse." West Indian sponge is harsher, coarser, and less durable than its Mediterranean congener.

Sponge has many uses besides those of the household. It is indispensable to the surgeon; mattresses, etc., are stuffed with it; and it is also employed as a filter and as a polishing material for fine surfaces.

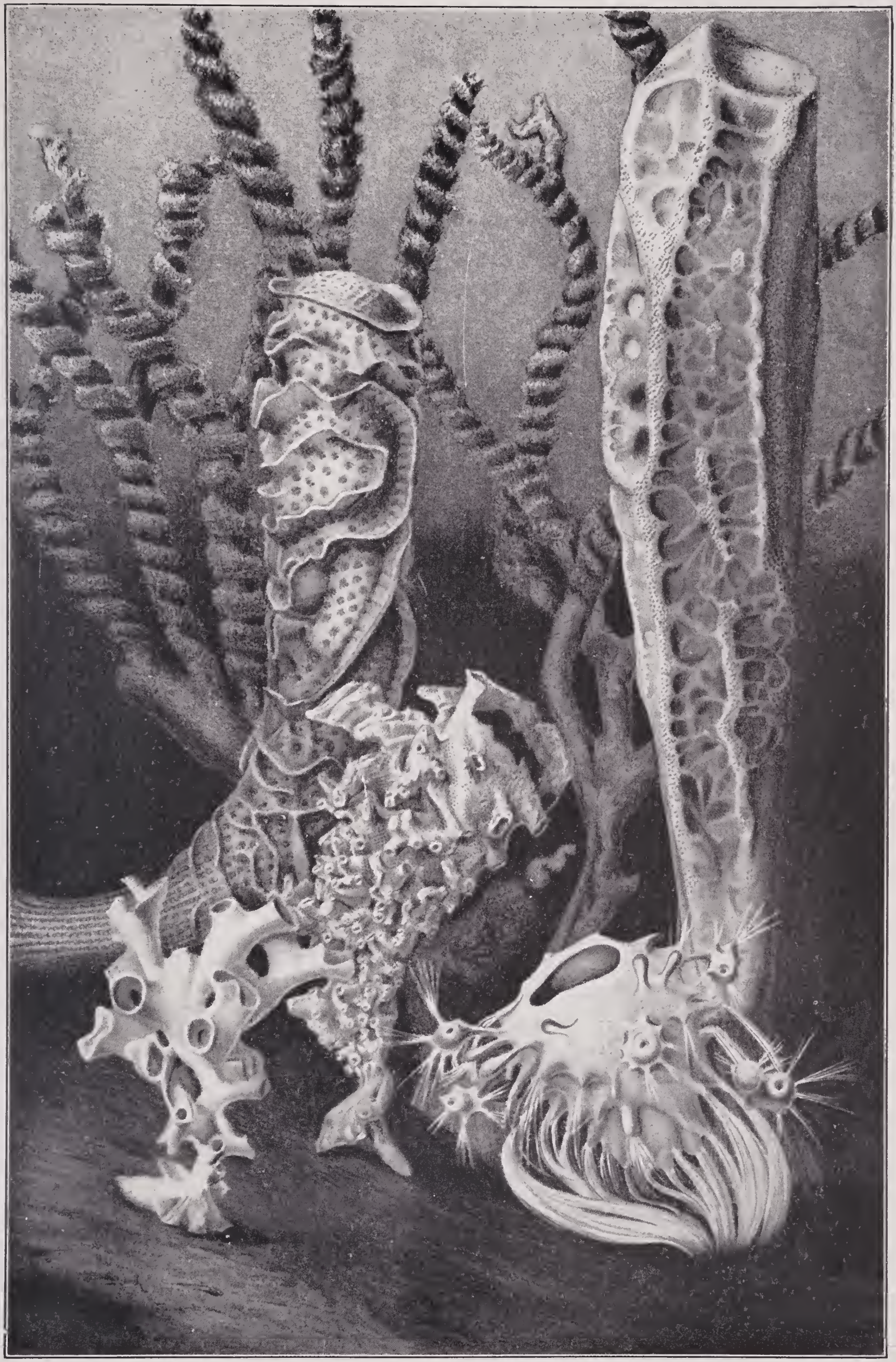
Florida Sponge Fishery.— The State of Florida is most advantageously situated for sea fisheries, and from the earliest settlement the coast fisheries have been more or less important. About two-thirds of the boundary is washed by the waters of the Atlantic and Gulf of Mexico, and, as is usual in countries of this latitude, the warm seas are most favorable for the growth of marine life. In addition to this, Florida has a great number of bays, lagoons, and bayous, and the coast is hemmed in by reefs and bare and broad shoals, all of which are excellent resorts for many forms of fish. While it is questionable if the individuals of any one species are here more abundant than in more N. latitudes, it is certain that there is a greater variety of species.

For the present the sponge fishery is the most valuable branch of the industry. It is confined to the S. W. part of the coast, along the reefs, and to the extensive rocky shoals that lie between St. Mark's and Anclote Keys. Accurately speaking, the sponge reef begins a few miles E. of Appalachicola, and hugs the coast within 50 miles of Cedar Keys. Then there is a break of 100 miles, after which it reappears and runs S. without interruption to Key West and the Bahama Islands. This reef, a rocky ridge, sometimes of genuine limestone, but generally of coral, begins some 6 or 8 miles from shore and continues out indefinitely. Wherever there is a rocky bottom sponges are said to be found, and the only reason why the fisheries do not extend completely around the gulf coast is that in places, as off the coast of Texas or Cedar Keys, this rocky bottom begins in water too deep to permit of profitable sponging. The average depth of water on the St. Mark's reef at 6 miles from land is 16 feet. The sponges are in great abundance and of good quality, being much better than those from the coast of Mexico, but rather inferior to the Bahama variety. The supply is practically inexhaustible, as they grow almost as fast as gathered, a sponge requiring only about two years to reach maturity.

Nearly all of the sponges used in the United States were brought from the Mediterranean till 1852, when attention was called to the immense numbers that were growing in Florida waters. As soon as it was found that the quality of these compared favorably with those of Europe the merchants and fitters-out of vessels of Key West engaged very actively in the business of placing them on the market. At first the best qualities were bought from the fishermen at the rate of 10 cents per pound. As Mediterranean sponges became scarce and costly the Florida sponges came into more and more demand, and their value increased proportionately. After about 18 years' fishing on the known ground the supply began to fail. Then, in 1870, a new area of ground, larger than the old one, was discovered, and this gave a new impetus to the trade. In that year Appalachicola sent out a small fleet of sponge vessels which has since been largely increased, and the industry has been energetically pursued with good results.

The methods employed in the fishery differ greatly from those employed in the Mediterranean, where divers go down and bring up the sponges. Small vessels, carrying crews of from 5 to 15 men, are fitted out at Key West and Appalachicola for trips of from four to eight weeks on the sponge grounds. The crews are paired off into small rowboats, or "dingies," to catch the sponges. One man stands in the stern, sculling the boat, while the other kneels in the bottom amidships, with the upper half of his body leaning over the side, and scans the bottom of the sea. To aid the eye an instrument called a "water glass," which is a common water bucket whose wooden bottom has been replaced by one of glass, is used by setting it in the water and thrusting the face as far into it as convenient. When a sponge is sighted the boat is stopped, and the kneeling man uses a two-pronged hook, attached to a slender pole 30 or 40 feet in length, to secure it. Considerable dexterity is required of both men. To cure the sponges they are first spread about the vessel's deck in their natural upright position, so that they will die, and while decomposing allow the gelatinous matter to run off freely. When they have been several days in this position they are taken to the shore and thrown into the water in little pens, called "crawls," where the remaining substance is soaked and squeezed out. The spongers thus work on, day after day, under a tropical sun that burns and browns the skin till one cannot tell a white man from a negro. It is a desperately hard life, more severe than any other that one can think of, and it requires men of no ordinary constitution to stand up to it. The spongers are therefore naturally an exceedingly muscular set.

The principal season for this fishery is the summer, from May to August, but the best conditions of the water are in winter, and a great deal of the fishing is then carried on with success. During the hurricane months of August, September, and March the ves-



GLASS SPONGES (HEXACTINELLIDÆ).

sels are nearly all laid up. The state of the weather greatly affects the result of the fishery. When the water is made rough by long continued strong winds sponge catching becomes impracticable. In some years the fishery has been a complete failure, while in others it has been very profitable, always owing to the weather. As the natural beds of sponges have become scarcer prices have advanced, so that even if a vessel does not secure as large a quantity in a given time as formerly the financial result is about the same.

There are several varieties of sponges caught in the Florida waters. There are first, sheep's wool, which sell for $1.00 to $5.00 a pound; second, yellow sponges, which sell for 20 to 60 cents per pound, and third, grass sponges, which are coarse in texture and not durable, and sell for 10 and 20 cents per pound. When these are marketed they are trimmed and cleaned of sand and shells, and then pressed into small bales of 100 to 120 pounds each, in which form they go to the wholesale dealers. Some attempts have been made to cultivate the more valuable kinds of sponges, and in some instances the experiment has met with success. It seems probable that the future supply of the sheep's wool variety will depend on some such action as this. Besides being scarcer along the sponge reef, this variety grows slower than the coarser kinds, and the demand for it is always greater than the supply.

Spongin, in chemistry, an insoluble substance obtained from sponge by treating it with ether, alcohol, water, hydrochloric acid, and dilute soda ley. It closely resembles fibroin, but is insoluble in an ammoniacal solution of copper, and, when boiled with sulphuric acid, yields leucine, but not tyrosine.

Sponging House, or **Spunging House,** in Old English law, a house or tavern where persons arrested for debt were lodged for 24 hours before being put into prison, to allow their friends an opportunity of settling the debt. They were usually the private dwellings of the bailiffs.

Spongy Bones, in anatomy, various bones of spongy texture. The superior bone is the superior turbinated process of the nose, the middle spongy bone its middle meatus, and the inferior one the inferior turbinated or maxillo-turbinate bone. There are also ethmoidal and sphenoidal spongy bones.

Sponsors. See GODFATHER AND GODMOTHER.

Spontaneity, in ordinary language, the quality or state of being spontaneous, or of acting from natural feeling, inclination or impulse, without constraint or external force. In biology, the tendency to variation, unrestrained by environment. In mental philosophy, the doctrine that muscular activity may and does arise from internal causes apart from and independent of the stimulus of sensations. It supposes that the nerve centers, after repose and nourishment, acquire a fullness of vital energy which discharges itself in the play of movement without any other occasion or motive. The addition of a feeling or end enhances and directs the activity, but does not wholly create it. Freshness in horses, the gambols of puppies and kittens, and the boisterous play of children, are examples of spontaneity.

Spontaneous Combustion. See COMBUSTION.

Spontaneous Generation, a term applied to the real or imaginary development of lowly organisms from non-living matter. When organic substance is exposed to the air it putrefies, and at the same time living animals — maggots, infusoria, and others, according to the nature and conditions of the substance — appear in it. The question is, whence do the living animals come; from the organic stuff or from germs present in it or in the air? There is a further question — what is the cause of the putrefaction; is it an ordinary process of slow oxidation or is it caused by the living organisms? If the dead organic matter can give rise to life, then we know something of the mode of origin of life on this planet, for we can make solutions of inorganic salts that will support life, and might therefore also give origin to it; if not, then we are entirely ignorant as to that origin. For many years no one has doubted but that, if one is careful to exclude all germs from the organic stuff, no life can proceed from non-living matter, even if it has once formed part of some living organism and is in the most complex state in which such matter is known to us. The matter is therefore one of historic interest chiefly.

As long ago as 1870 Huxley, in his presidential address to the British Association, was able to say that it appeared to him, within certain limitations, that the doctrine of biogenesis, that life proceeds from life only, was victorious along the whole line. These limitations were, he said, that if he could have been a witness of the early stages of the earth's history, when the physical and chemical conditions were different from those that now hold, he would have expected to see the evolution of living protoplasm from non-living matter. As these limitations are still often thought inconsistent, and as by other people the denial of spontaneous generation seems inconsistent with a belief in evolution, it will be well to quote Herbert Spencer's reply to a critic who urged objections on this ground of inconsistency. In his "Principles of Biology"

(vol. i., Appendix, 1868), he says: "I do not believe in the 'spontaneous generation' commonly alleged, and so little have I associated in thought this alleged 'spontaneous generation,' which I disbelieve, with the generation by evolution, which I do believe, that the repudiation of the one never occurred to me as liable to be mistaken for repudiation of the other. That creatures having quite specific structures are evolved in the course of a few hours, without antecedents calculated to determine their specific forms, is to me incredible. Not only the established truths of biology, but the established truths of science in general, negative the supposition that organisms having structures definite enough to identify them as belonging to known genera and species can be produced in the absence of germs derived from antecedent organisms of the same genera and species. If there can suddenly be imposed on simple protoplasm the organization which constitutes it a paramecium I see no reason why animals of greater complexity, or indeed of any complexity, may not be constituted in the same manner. In brief, I do not accept these alleged facts as exemplifying evolution, because they imply something immensely beyond that which evolution, as I understand it, can achieve. In the second place, my disbelief extends not only to the alleged cases of 'spontaneous generation,' but to every case akin to them. The very conception of spontaneity is wholly incongruous with the conception of evolution." On the other hand he says, "Granting that the formation of organic matter and the evolution of life in its lowest forms may go on under existing cosmical conditions, but believing it more likely that the formation of such matter and such forms took place at a time when the heat of the earth's surface was falling through ranges of temperature at which the higher organic compounds are unstable, I conceive that the molding of such organic matter into the simplest types must have commenced with portions of protoplasm more minute, more indefinite, and more inconstant in their characters than the lowest rhizopods — less distinguishable from a mere fragment of albumen than even the protogenes of Professor Haeckel. The evolution of specific shapes must, like all other organic evolution, have resulted from the actions and reactions between such incipient types and the environment, and the continual survival of those which happened to have specialties best fitted to the specialties of their environments. To reach by this process the comparatively well-specialized forms of ordinary infusoria must, I conceive, have taken an enormous period of time." Again, "That organic matter was not produced all at once, but was reached through steps, we are well warranted in believing

Spontaneous Generation

by the experience of chemists. Organic matters are produced in the laboratory by what we may call artificial evolution. Chemists find themselves unable to form these complex combinations directly from their elements, but they succeed in forming them indirectly by successive modifications of simpler combinations." We may say then that it is certain that living organisms, large enough to be visible with the help of a microscope and definite enough in form and structure to be classified with other known genera, do not grow at present from non-living matter. But it is not therefore certain that protoplasm of living matter may not be so formed in extremely small quantities, too small to be visible and of simple or no structure, but yet sufficiently complex in composition to serve as food for other and more highly developed animals. Whether this be so or not, Huxley and Spencer and nearly all biologists agree in believing that in past time molecules of simple matter by some series of reactions became aggregated till a matter, sufficiently complex and sufficiently unstable to be called living matter, was formed, while there is no evidence that any such generation is taking place at present.

We will now give a summary of the history of this inquiry, based on Huxley's presidential address of 1870, and to a less extent on Tyndall's article in the "Nineteenth Century," January, 1878. Expressions and phrases will be freely quoted from these authors.

History.— It must always have been a matter of common experience that many articles of food are apt to become moldy and to putrefy if kept too long. Associated with mold and with putrefaction are various sorts of low forms of life. The ancient philosophers never doubted that these were generated in the matters in which they made their appearance. Indeed, all men believed this till past the middle of the 17th century. But in 1660 in Italy, in those days the home of learning, Francesco Redi published his "Esperienza intorno alla Generazione degl' Insetti." He was no theorist, but a careful experimenter. Here, said he, is meat; if I expose it to the air in hot weather, in a few days it putrefies and swarms with maggots; but if I protect similar pieces of meat by covering them with fine gauze, then, though they still putrefy, not a maggot makes its appearance. From this experiment it becomes obvious that the maggots are not generated in the meat, but that the cause of their formation is something that is kept away by fine gauze. This something can be easily shown to be blowflies, for these, attracted by the meat, swarm near it and lay their eggs on the protecting gauze, eggs from which maggots are shortly hatched. Now this is the principle of the

Spontaneous Generation

whole matter; keep away all living things which might come to the meat and the meat will not create any living things, will not even putrefy if one kills any living animals or germs of animals that may be in the meat. The protecting gauze must be fine enough, that is all. Redi of course was accused of controverting Scripture, because of the story of the bees which were said to be generated in the carcass of the lion. But his doctrine of biogenesis flourished for a century. Indeed when, through the development of the microscope, the numerous provisions for the production of germs were made known, the hypothesis of abiogenesis, that life could come from what was not living, appeared absurd.

Leeuwenhoek, 1632–1723, is remarkable as being the first man to demonstrate existence of unicellular organisms. During the 18th century the microscope was greatly improved. The animalcules (infusoria) which in a few days will swarm in any infusion of organic matter became visible, and Needham, on theoretical grounds, doubted whether Redi's generalization, "no life without antecedent life," held true for these lowly forms of life. He put his doubts to the test. He argued that if the infusorial animalcules came from germs, then the germ must exist either in the substance infused or in the water used to make the infusion or in the air that touches both of them. The life of all germs is destroyed by heat. If, therefore, the infusion be boiled, any germs present will be killed; and then if the infusion be shut off from the air no more germs can get into it. Now, if after this treatment animalcules still appear in the infusion they will have been generated from the infused substance or from the water; but if they do not appear, then Redi's dogma will be true for infusoria. He therefore boiled and corked infusions of various substances, and in every case after a longer or shorter time animalcules appeared and flourished. Needham was associated in much of his work with Buffon. The French naturalist had a theory of life to which Needham's experiments lent support. Life, he thought, was the indestructible property of certain molecules which he described as "organic molecules." All living organisms, he said, are built up of such molecules; death is nothing more than their dissociation. When they are thus set free they take the form of infusorial animalcules. It is necessary to distinguish this theory, which is so ingenious, from the theory of abiogenesis, the antithesis to that of biogenesis, which supposes that life may and does arise from non-living matter.

But the theory of Buffon, and especially the experiments of Needham, which lent it support, did not seem satisfactory to Spallanzani. He saw two sources of error — first, the germs present in the infusion might have escaped death through not having been boiled long enough; and secondly, the corks, perhaps, were not perfectly effective, and air containing germs might have got into the flask and infected the infusion. So he too prepared infusions; but he boiled them for three-quarters of an hour and then fused the necks of the flasks. He found after this treatment that the infusions remained perfectly free from living organisms for as long as he chose to keep them. It might seem that this must be the end of the whole matter; but the event proved otherwise. This time it was the chemists who reopened the discussion. Oxygen was discovered, the theory of respiration was begun, and it was proved that a supply of free oxygen is one of the conditions of life and also of putrefaction. So it was possible that Spallanzani's infusions did not produce life either because the "organic molecules" were altered in some way by being boiled, or because they were unable, owing to the absence of oxygen, to live. So the experiments had to be repeated in such a manner that the organic matter was not altered, and so that there was sufficient oxygen. Schultze and Schwann in 1836 took up the matter. They carefully boiled their infusions and then supplied air; but they made it pass through red-hot tubes first, so that any germs present in it would be burned. In these conditions no animalculæ appeared in the infusions; but if they were exposed to air which had not been heated then animalculæ appeared in abundance. Therefore boiling does not injure the vitality of the "organic molecules," if there are such, and there is only one possible objection to the conclusions drawn from such experiments, if they be properly conducted, and that is that what the red-hot tubes destroy is not germs, but something else that may be non-living and yet essential to life.

Now about this time Cagniard de la Tour discovered that fermentation, like putrefaction, is always accompanied by the presence of minute living creatures. Common yeast, for instance, is a mass of minute plants. When it was suggested that the living creatures not only accompanied but actually caused the processes of fermentation and putrefaction, the chemists, led by Liebig and Berzelius, laughed the idea to scorn. But in 1843 Helmholtz ingeniously separated a putrescent from a putrescible fluid by a membrane, so that the products of putrefaction could mix with the putrescible matter; but that did not in consequence putrefy. Therefore it followed that the cause of putrefaction must be either a colloid — indiffusible stuff — or a solid. In 1854–1859 Schroeder and Dusch cleared up this point by experiments which were simply refinements on the original ones of Redi;

instead of using a screen of gauze to keep off blowflies they used a screen of cotton-wool, a screen with meshes so fine that not even the tiny germs can pass through them. They boiled infusions, and while the steam was coming off freely they plugged the neck of the flask with cotton-wool. Now this plug did not keep away oxygen, nor did it in any way heat or alter the air that passed to the fluid, as the red-hot tubes of Schulze and Schwann had done, and yet no animalcules appeared in the boiled infusion screened by cotton-wool. It is therefore proved that the cause of putrefaction and fermentation and the origin of the living forms that accompany these processes must be small particles that exist in the air.

But in 1859 Pouchet published his "Hétérogénie." He once more raised clouds of doubt. It seemed evident to him that spontaneous generation was one of the means that nature employed for the reproduction of living beings. If, he said, all putrefaction is the result of life present, as germs, in the air, then the air in which we live would have almost the density of iron! About this time Pasteur took the matter up. though advised by his friends, in view of the difficulty of the subject, not to do so; at least, said Dumas, do not spend too much time over it. But in 1862 he published a paper "On the Organized Particles Existing in the Atmosphere." He had collected the floating dust of the air and examined it with a microscope. He saw that much of it actually consisted of organized particles, and on his sowing these in suitable sterilized infusions there grew from them rich crops of animalculæ. He also showed that these germs of life were not universally diffused in the air. He opened his sealed flasks in the pure air of the Mer de Glace. Only 1 out of 20 such flasks thus opened became filled with life; while 8 out of 20 opened in the air of the plains did so, and all of them did so if opened in the air of towns. These researches of Pasteur were necessary before Lister could have brought his system of antiseptic surgery to a successful issue; while he himself, as is well known, has done great work on the relations of these forms of life to many industries and diseases. The germs of the air were then studied by Cohn, shown by him to be bacteria, and the basis of a sound knowledge of them was laid.

In 1869 Tyndall hit on a very precise method of determining the absence or presence of dust particles in the air, a method much more searching than that furnished by the most powerful microscope. He was experimenting in another direction, and had need of air free from dust. He noticed that such matter (dust) passed easily through liquids. A beam of light shows the presence of dust particles in the air by the reflection that occurs from the surface of such. Tyndall showed that whenever dust was present the putrefaction occurred sooner or later, when it was absent it did not. Tyndall's apparatus was a box with glass sides, into the bottom of which the mouths of flasks penetrated, the lower parts being outside the box, so that the contained infusions could be boiled. A beam of sunlight was allowed to pass through the box; it showed the presence of dust in the air in a way with which every one is familiar. The inside of the box was then coated with glycerin, and the whole was kept as still as possible. After some time the dust particles sank to the floor of the box and stuck to the glycerin, and a beam of sunlight passing through was quite invisible, there not being anything to reflect it. The infusions were then boiled for a long time, and then allowed to cool, after which they might be kept for months without putrefying or showing any signs of the presence of life. Here all the conditions of the infusions were natural, save that there was no dust in the air above them. In the dust of the air therefore are solid germs of life. The opponents of the doctrine of biogenesis had long made objection to it, saying that "if true then the air must be thick with germs; now this is absurd, therefore the doctrine is untrue." An argument this that shows that a *reductio ad absurdum* is not always a proof.

The researches of Tyndall called forth the first utterances on the subject of Bastian, the latest obscurantist. Two years later, 1872, Bastian published his work, in two volumes, on "The Beginnings of Life." In the preface he states that the question of spontaneous generation turns wholly on the probability of the *de novo* origin of bacteria, and further that evidence of the most convincing character shows that bacteria are killed by a temperature of 140° F., yet similar organisms will constantly appear in closed flasks containing organic fluids that have been exposed for some time to a temperature of 212° F. It is surprising that any man could at that late day have been found to urge such stale arguments after the repeated demonstration of the two sources of error in such experiments — (1) that fresh bacteria might get in after the original set were killed; (2) that though adult bacteria are killed by a temperature of 140° F., their germs are not always killed by a much higher temperature. Bastian's work has been quietly forgotten, and since then the progress of discovery as to the nature and mode of origin of bacteria and all other forms of life has progressed steadily.

Spontini, Gasparo, an Italian composer; born in Majolatti, near Jesi, in the Roman States, Nov. 14, 1774. He was educated at the Conservatorio de la Pietà of

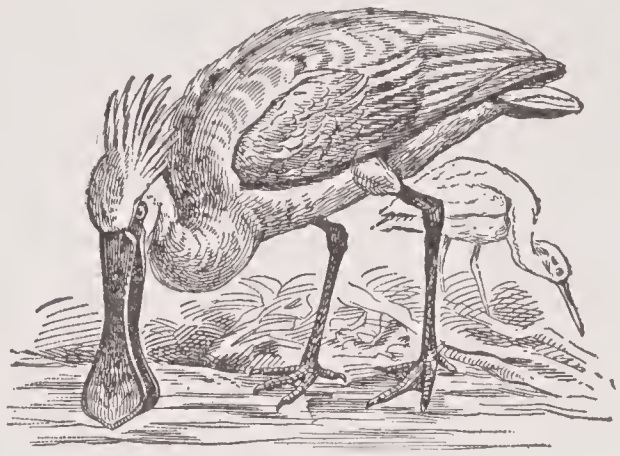
Naples, and began his career when 17 years of age as the composer of an opera, "The Punctilio of Women." This was followed by some 16 operas, produced within six years, for the theaters of Italy and Sicily, but not a note of which has survived. In 1803 Spontini went to Paris; in 1807 he was appointed music director to the Empress Josephine; and in 1808 he produced his most famous work "The Vestal" with brilliant and decisive success. His "Fernando Cortez" appeared in 1809; and the next year witnessed his appointment to the directorship of the Italian Opera in Paris, which he held for 10 years. In 1820 the magnificent appointments offered by the court of Prussia tempted him to leave Paris for Berlin, in which capital his three grand operas, "Nourmahal" (founded on "Lalla Rookh"), "Alcidor," and "Agnes of Hohenstauffen," were produced with great splendor. Spontini continued to reside as first chapel master in Berlin till the death of the king in 1840. The latter period of his sojourn at Berlin was embittered by professional disputes; and in 1842 he repaired to Paris, where in 1839 he had been elected one of the five members of the Académie des Beaux Arts. He died in Majolatti, Jan. 14, 1851.

Spontoon, the half-pike formerly carried by infantry officers, and used for signalling orders to the regiment. Their use was discontinued in the British army in 1787.

Spool, a hollow cylinder on which thread may be wound. It assumes various forms: The ordinary spool or reel for sewing-cotton; the spool for winding machines, otherwise called a bobbin; the spool to hold the thread in a shuttle, and revolving on a spindle in the latter.

Spoon, a domestic utensil, having a shallow bowl at the end of a handle, and used for taking up and conveying to the mouth liquids or liquid food. Spoons are made of various sizes and materials, according to the particular purpose for which they are intended. Spoons for the administration of medicine are made with a cover or shield which converts the pointed end into a funnel. In cotton manufacturing, a weighted and gravitating arm in the stop-motion of a drawing machine, which is kept in position by the tension of the sliver, and falls when the sliver breaks or the can is emptied, and thereby arrests the motion of the machine. Wooden spoon is a term applied in Cambridge (England) University to the student last on the list of mathematical honors.

Spoonbill, in ichthyology, the genus *Polyodon.* In ornithology, any individual of the genus *Platalea;* specifically *P. leucorodia,* the white spoonbill, found over the greater part of Europe and Asia and the N. of Africa. The adult male is about 32 inches long; plumage white with pale pink tinge; at the junction of the neck with the breast there is a band of buffy yellow; the naked skin on the throat is yellow; legs and feet black; bill about eight inches long, very much flattened and grooved at the base, the expanded portion yellow, the rest black. There is a white occipital crest in both sexes.



THE SPOONBILL.

The spoonbill possesses no power of modulating its voice. The windpipe is bent on itself, like the figure 8, the coils applied to each other and held in place by a thin membrane. This peculiarity does not exist in young birds. The roseate spoonbill (*P. ajaja*), a native of the United States, has rose-colored plumage.

Spoonworm, a name for various animals of the class worms or *Anarthropoda,* section Gephyrea, in particular *Thalassema Neptuni,* so called on account of the spoon-like appendage to the proboscis, around which is a circle of tentacula. It is much used as a bait by fishermen. All the species of this genus are remarkable for the wonderful power of contraction and expansion possessed by the skin, and the extraordinary manner in which they can alter their shape. Allied spoonworms belong to the genus *Sipunculus.* All are inhabitants of the sea.

Sporades, the general name for a group of small islands in the Grecian Archipelago, lying to the E. of the Cyclades. They belong partly to Greece and partly to Turkey. The principal are Scio, or Chios, Samos, Cos, Rhodes, Lesbos, and Patmos.

Sporadic, a term applied to any disease that is commonly epidemic or contagious, when it attacks only a few persons in a district and does not spread in its ordinary manner. The conditions which determine the occurrence of epidemic or contagious diseases in a sporadic form are unknown. Among the diseases which occur in this form may be especially mentioned cholera, dysentery, measles, scarlatina, and smallpox.

Sporangium, in botany, the case in which the spores or reproductive germs of cryptogams are formed.

Spore, the reproductive body in a cryptogam, which differs from a seed in being composed simply of cells and not containing an embryo. Called also sporules. Applied also to the reproductive bodies produced either singly or at the tips of the fruit-bearing threads in fungi. Plants reproduce themselves in two different ways, "vegetatively" or "truly." The vegetative mode of reproduction is merely a continuous growth of parts already formed. It is quite common in nature. Sometimes entire buds separate from the parent plant and produce independent plants. This happens, for example, with some of the buds in the axils of the leaves of *Lilium bulbiferum*. Sometimes entire pieces of a creeping stem separate from the main stem and begin an independent life. This happens in the case of the strawberry plant. Artificially also a vegetative mode of reproduction is easily brought about. Every one knows how gardeners propagate many species of plants by means of cuttings. As a rule the more lowly the plant the more easy is it to make a successful cutting, and the smaller may the cutting be. Thus, a single leaf or even a small part of leaf of a moss plant will often, if cut off and placed in a suitable soil, grow into a complete moss plant. In the true mode of reproduction the growth is not continuous. Certain cells of a plant are set apart for this function. These cells are called spores. In plants higher than the *Thallophytes* such cells do not grow directly into a plant like that from which they have come, but they give rise to a plant which in its turn, when it reaches maturity, produces cells of two sorts, male and female, which unite with one another, and then from the new cell of dual origin there grows a plant like that from which the spore originally came. Thus, on the under surface of the fronds of ferns there may often be seen many small spore cases. The spores fall to the ground, and produce a little green plant called the prothallium of the fern. The prothallium produces the sex elements. These unite, and from their union grows a new "fern." This indirect mode of reproduction is spoken of as the alternation of generations.

In the *Thallophytes* (algæ, fungi, etc.), the cells which function as spores receive a variety of names, such as telentospores, aredospores, sporidia, stylospores, tetraspores, zoöspores (which are motile), conidia. These names are meant to emphasize some point in their mode of origin and development. In the *Bryophytes* (liverworts and mosses) and in the *Pteridophytes* (ferns, horsetails, etc.), they are always called simply spores. But some of the *Pteridophytes* (vascular cryptogams), for instance salvinia, produce two kinds of spores, male and female, and hence they are called heterasphorus ferns, horsetails, or lycopods as the case may be. In the *Spermophytes* also (seed plants or phanerogams) the spores are of two kinds. The pollen grains represent the male spores, microspores; and the female spores are contained within the ovule.

The sexual generation, the prothallium, which is formed from the spore, loses its character as an independent plant as we ascend the scale of plants from the vascular cryptogams to the phanerogams. In homosporous ferns it lives for a long time; in the heterosporous ferns they, the male and female prothallia, never become entirely separate from the spores, though they burst through the spore cases; in the *coniferæ* they remain entirely within the spore case. In the phanerogams they are still further reduced; the ovule is the macrosporangium.

Sporendonema, in botany, either a genuine genus of hyphomycetous fungi, or a spurious one, founded on some half developed fungals. *S. muscæ* grows on flies in autumn and kills them. The fly attacked adheres to the walls or window panes by its proboscis, with its legs spread out. About 24 hours after death a white substance projects from between each ring of the abdomen, and in a day or two after there is a circle around the body. Called also empusa or empusina.

Sporidium, in botany, a name given to the spores of fungi and lichens when they are contained in asci or little sacs. Sporidia, like spores, may consist of one or more cells, and these may be covered with a distinctly organized cuticle, as in many truffles.

Sporran, or **Sporan,** the pouch or large purse worn by Highlanders in full dress, and by men of the kilted regiments. It is usually made of the skin of some animal with the hair on, and often ornamented with silver and stones. It is worn in front of the kilt.

Sporting Plant, in botany, the name given by gardeners to plants which have suddenly produced a single bud with a new and sometimes widely different character from that of the other buds. Darwin calls them bud variations, and says that they can be propagated by grafts, etc., and sometimes by seed. They rarely occur in plants in a state of nature, but are common under culture.

Sports, Book of, in English history, a proclamation issued by James I., on May 24, 1618, entitled: "The King's Majesty's Declaration to his subjects concerning lawful sports to be used." It is often represented as enjoining sports on the Lord's day. It only enacted that people "should not after the end of Divine service be disturbed, letted, or discouraged from any lawful recreations." Its first publication led to

a Sabbatarian controversy. The Declaration was embodied in a similar document issued by Charles I. in 1633, and the severity with which the public reading of it by the clergy was enforced aroused the Puritans to a degree of indignation which contributed not a little to the overthrow of the Monarchy and the Establishment. In 1644 the Parliament ordered all copies of it to be called in and publicly burned.

Spot Lens, a hemispherical lens with a large opaque spot in the center of its plane face, adjustable with this plane side upward under the stage of the microscope, so that the object is in the focus of the rays which it converges from the mirror. The effect of this arrangement is that no direct light from the mirror can enter the objective, the spot causing a central shadow, but the light received by the object from the marginal rays and reflected again by its particles does enter. Hence the object appears as if brightly self-illuminated on a dark background.

Spotted Blenny, the *Blennius vulgaris,* a fish from five to seven inches long. Its thinness has also acquired for it the epithet of gunnel or gunwale, such being the name of the thin deal forming the upper streak of a boat, which the fish is supposed to be like. Called also spotted gunnel and butterfish.

Spotted Fever, the name given to a form of malignant typhus fever, which is accompanied by a rash or eruption of red spots. See TYPHUS FEVER.

Spotted Tree, in botany, the *Flindersia maculosa,* a native of Queensland; so named because the trunk is covered with spots, owing to the outer bark falling off in patches.

Spotted Wild Cat, the *Felis torquata,* an Indian species, about 18 inches long, the tail being about a foot more. It is gray, spotted with black, and the ears are tufted, indicating a relationship with the lynxes.

Spottiswoode, John, a Scotch clergyman; born in Scotland in 1565; was educated at the University of Glasgow, and at 18 succeeded his father as pastor of Calder. In 1601 he attended the Duke of Lennox as chaplain on his embassy to France, and in 1603 King James to London. Soon after he succeeded James Beaton as Archbishop of Glasgow, but was only consecrated in London in 1610. As moderator of the General Assembly at Glasgow in 1610 he labored to confirm episcopal government, and he forced the Perth Assembly (1618) to sanction the five points of discipline known as the Perth Articles. He was translated to the see of St. Andrews in 1615. He officiated at the coronation of Charles I. at Holyrood in 1633, and in 1635 became Chancellor of Scotland. He reluctantly entered into the king's unwise measures for the introduction of a liturgy into Scotland, and naturally became hateful to the Covenanters. The king compelled him to resign the chancellorship in 1638, and that same year the Glasgow General Assembly deposed and excommunicated him. His chief work is the well-known "History of the Church of Scotland" (1655). Spottiswoode died in London, Nov. 26, 1639, and was buried in Westminster.

Spottiswoode, William, an English mathematician; born in London, Jan. 11, 1825; was educated at Harrow and Balliol College, Oxford. He took a first-class in mathematics in 1845, and later both the junior and senior university mathematical scholarships. For some time he lectured at Balliol, and in 1846 he succeeded his father as the head of the great printing house of Eyre & Spottiswoode. Though throughout life an energetic man of business, he found time for much original work in abstract mathematics and experimental physics; as well as for travels in Eastern Russia (1856), Croatia and Hungary (1860). His contributions to the "Proceedings" of the Royal Society, the "Philosophical Magazine," the London Mathematical Society "Proceedings," and his admirable lectures on the "Polarization of Light," reprinted in the "Nature" series (1874), are known to all students. Spottiswoode was treasurer of the British Association (1861–1874), of the Royal Institution (1865–1873), and of the Royal Society (1871–1878); president of Section A (1865) and of the British Association itself (1878), of the London Mathematical Society (1870–1872), and of the Royal Society from 1879 till his death in London, June 27, 1883.

Spottsylvania Court-house, a small village in Virginia, 55 miles N. by W. of Richmond, the scene of one of the most desperate battles of the American Civil War. On May 10, 1864, during the Wilderness campaign, Grant attacked Lee in his earthworks, and was repulsed with dreadful slaughter; yet on the next day he wrote to the Secretary of War, "I propose to fight it out on this line if it takes all summer," and on the 12th repeated the assault, when Hancock's corps carried and held the "bloody angle." The next morning Lee, unable to bear his share of the heavy losses, withdrew within an inner line of entrenchments, and on the 20th Grant, having failed to dislodge him, moved round his flank toward Richmond.

Spout Shell, a name sometimes given to the pelican's foot (*Aporrhais pes-pelecani*), a British mollusk: so called from the manner in which the aperture of the shell is lengthened into a kind of spout in front. Also a name of several mollusks that squirt out water.

Sprague, Austin Velorous Milton, an American inventor; born in Rochester, N. Y., May 28, 1840. He went to the Pennsylvania oil fields in 1865, and turned his attention to improving methods of oil production. In order to prevent boiler explosions because of the use of brackish water, he conceived and executed a plan for raising the water of the Allegheny river to a reservoir whence it flowed to feed several hundred boilers. He was the inventor of various household articles; improvements in laundry machinery; disinfectors, sterilizers, and thermærotherapic apparatus; introduced steam for the sterilization of surgical instruments and dressings, and for the disinfection of textile fabrics, etc.

Sprague, Charles, an American poet; born in Boston, Mass., Oct. 26, 1791; was the author of "The Winged Worshipers"; "Curiosity"; and "The Family Meeting." A collection of his works entitled "Poetical and Prose Writings" was published in 1841. He died in Boston, Jan. 22, 1875.

Sprague, Charles Ezra, an American author; born in Nassau, N. Y., Oct. 9, 1842. He was an officer through the Civil War, and afterward the secretary and president of a New York bank. He was the editor of "Volaspodel," the organ of the proposed international language called Volapük, and wrote: "Logical Symbolism" (1882), and "The Handbook of Volapük" (1888). Also a well-known poem, "The Story of the Flag" (1886).

Sprague, William, an American statesman; born in Cranston, R. I., Sept. 12, 1830; was governor of Rhode Island in 1860–1863; raised a battery of light artillery with which he took part in the battle of Bull Run; served with distinction in the Peninsular campaign; and was United States Senator in 1863–1875. For many years he was one of the most extensive manufacturers in New England, and was long active in Rhode Island politics. He married Kate, daughter of Chief-Justice Salmon P. Chase, who was divorced from him.

Sprague, William Buell, an American clergyman; born in Andover, Conn., Oct. 16, 1795; studied at Yale and Princeton; settled as pastor at West Springfield in 1819; transferred to Albany, N. Y., in 1829; but in 1869 went to Flushing, L. I., where he died, May 7, 1876. He wrote many evangelical sermons, etc., but his chief work is "Annals of the American Pulpit" (1859–1860).

Sprain, or **Strain,** a term employed in surgery to designate a violent stretching of tendinous or ligamentous parts with or without rupture of some of their fibers. Sprains are very frequent in all the joints of the upper limbs, especially in the wrist and the articulations of the thumb. In the lower extremity the ankle is the joint by far the most frequently affected; and this is accounted for anatomically by the small size of the articular surfaces, the great weight the astragalus (the bone presenting the lower articular surface) has to support, and the unyielding nature of the lateral ligaments. In slight sprains of this joint the ligaments are only stretched or slightly lacerated, but in more severe cases they may be completely torn through. Sprains of the ankle are sometimes mistaken for fractures, and vice versa; and the two injuries may coexist. The pain and swelling sometimes make an accurate diagnosis difficult, especially if the patient is not seen for some time after the accident. Sprains of the knee are not uncommon, and are characterized by great swelling from effusion of fluid within the joint. Sprains of the back are not infrequent accidents, and are the most serious of any, but in most cases it may be anticipated that after confinement in bed or on a sofa for two or three weeks, and with proper treatment, the patient will be able to walk, though he may feel stiffness and pain for several weeks longer.

The best treatment of a sprain depends chiefly on the time that has elapsed since the injury. If the patient is seen before swelling has occurred the application of cold by means of ice bags or running water, especially if a thin india-rubber bandage is previously applied, does much to control the swelling and the pain. At a later stage, if the pain be severe, warm applications (hot water, hot fomentations, or poultices) are generally very soothing; or lead and opium lotion may be employed. Where the swelling is very great leeches are sometimes most useful. When the pain is not very intense the joint may be enveloped in a large quantity of cotton-wool and gently but very firmly bandaged. It is important not to keep the injured joint too long at rest. As soon as the pain has subsided massage and gentle movements should be commenced; the patient should not be allowed to use the limb himself till these can be quite freely borne. In sprains of the back rest is the main requisite; but sometimes active antiphlogistic treatment is required; and a supporting jacket of gutta-percha or plaster of Paris may have to be worn for some time.

Among horses sprains or strains are very common, owing to the severe exertions required of them, often while they are young and unprepared for such work. Various muscles, ligaments, and tendons are liable to strain, but none more frequently than the large tendons passing down the back of the legs. In slight cases cold water continuously applied for several hours gives

relief; but in all serious cases diligent fomentation with water about the temperature of 100° is preferable; or the injured part may be swathed in a thick woolen rug, kept constantly moist and warm by frequent wetting with hot water. Perfect rest is essential, and in order to insure the relaxation of the large tendons of the horse's limbs he may in bad cases be kept slung for several days. Blisters, hot oils, firing, and all such irritants are on no account to be used till the inflammation abates and the part becomes cool and free from tenderness. Such remedies are then useful for causing the reabsorption of swelling, and perhaps also for invigorating the weakened part.

Sprat, the *Clupea sprattus,* a well-known fish, common on all Atlantic coasts of Europe, extending to the Baltic and the W. half of the Mediterranean. The length of those usually brought to market is about three inches; but it is said to attain about double that length. Scales smooth and easily shed; lower jaw prominent, oval patch of small teeth on tongue; abdomen serrated behind as well as in front of ventral fin. The sprat is taken in large quantities, and, in some localities, the supply so far exceeds the demand that they are spread on the ground for manure.

Sprat Sucker (*Lerneatoma spratti*), a genus of parasitic crustaceans, belonging to the *Lernæadæ,* and so named from its habits of infesting the eyes of sprats.

Spray Work, a method of decoration in which sprays and ferns are fastened on the material to be treated, over which marking ink, liquid Indian ink or sepia, is sprinkled by means of a fine-bristled tooth brush dipped into the coloring matter and then rubbed lightly to and fro across the large teeth of a dressing comb.

Spree, a river of Prussia, rises in the E. of Saxony, on the borders of Bohemia, and after a winding course of 227 miles, but bearing generally N. and N. W., falls into the Havel at Spandau; area of drainage basin, 3,655 square miles. The principal towns on its banks are Bautzen, Kottbus, and Berlin. By the Frederick William or Müllrose canal it is connected with the Oder. A couple of short canals assist navigation near Berlin. In the Spreewald, a district near Kottbus much cut up by the interlacing arms of the river, there still exists a colony of Wends.

Sprengel, Kurt, a German physician; born in Boldekow, Pomerania, Aug. 3, 1766. All his life was spent in quiet labor at Halle, from 1789 as Professor of Medicine and from 1797 as Professor of Botany. He won a reputation as a writer on the history of medicine and as a student of the anatomical structure and functions of plants. His principal books are: "Pragmatic History of Medicine" (5 vols. 1792–1803); "History of Botany" (1817–1818); and "New Discoveries in the Whole Realm of Botany" (1819–1822). He died in Halle, March 15, 1833.

Sprenger, Aloys, a German Orientalist; born in Nassereit in the Tyrol, Sept. 3, 1813; studied medicine, the natural sciences, and the Oriental languages at Vienna, next at London assisted Count Münster, and in 1843 sailed to Calcutta. For many years he was incessantly active as teacher, interpreter, librarian, and translator, till in 1857 he was called to be Professor of Oriental Languages at Bern. In 1881 he settled at Heidelberg. His rich collection of Arabic, Persian, Hindustani, and other MSS. and books is now in the Royal Library at Berlin. The most important of Sprenger's numerous works are: "Life and Work of Mohammed" (1861–1865); "Ancient Arabic Geography" (1875); and "Babylon" (1886); besides editions of Arabic and Persian works. Died in 1894.

Sprenger, Jacob, of the Order of Preachers, and Professor of Theology in Cologne, and Henricus Institor (Latinized form of Krämer), two names of enduring infamy as the authors of the famous "Malleus Maleficarum" or "Hexenhammer" (1489), which first formulated in detail the doctrine of witchcraft, and formed a text-book of procedure for witch trials. They were appointed inquisitors under the bull "Summis desiderantes affectibus" of Innocent VIII. in 1484, and their work is arranged in three parts—"Things that pertain to Witchcraft"; "The Effects of Witchcraft"; and "The Remedies for Witchcraft." It discusses the question of the nature of demons; the causes why they seduce men, and particularly women; transformations into beasts, as wolves and cats; and the various charms and exorcisms to be employed against witches. The writers detail the extraordinary dangers to which they were exposed in their task, and how all the artillery of hell had been employed against themselves in vain, and they tell with complete composure of mind how in one place 40, in another 50, persons were burned by their means. They admit bodily transmission of sorcerers through the air, and relate numerous cases of the devilish malice of witches on horses and cattle as well as mankind; and in the latter part, consisting of 35 questions, give minute directions for the manner in which prisoners are to be treated, the means to be used to force them to a confession, and the degree of evidence required for a conviction of those who would not confess. The book contains no distinct allusion to the proceedings at the Witches' Sabbath any more than did the "Formicarium" (1440) of John Nider, whose fifth

book is devoted to the subject of sorcery. See WITCHCRAFT.

Spring, an elastic substance of any kind, having the power of recovering, by its elasticity, its natural state, after being bent or otherwise forced, interposed between two objects in order to impart or check motion or permit them to yield relatively to each other. Springs are made of various materials, as india-rubber, strips of wire or steel coiled spirally, steel rods or plates, etc., and are used for many purposes; as, for diminishing concussions in carriages, for motive power, acting through the tendency of a metallic coil to unwind itself, as in clocks and watches; to measure weight and other forces as in the spring balance, etc. Springs of coiled wire are much used for balances, for chair and sofa cushions and backs, mattresses, and in various other domestic applications where no great amount of strength is required. Also, one of the four seasons of the year; that season in which plants begin to spring and vegetate; the vernal season. In the Northern Hemisphere the spring season begins about March 21, when the sun enters the sign of Aries and ends about June 22, at the time of the summer solstice. Popularly, however, spring is considered to begin in February or March, and end in April or May.

As a nautical term: (1) A crack in a mast or yard, running obliquely or transversely. (2) A rope or hawser passed from the stern of a ship and made fast to the cable on the anchor from the bow, by which she is riding. The object is to bring the broadside to bear in any direction. (3) A check on a cable while unshackling it. (4) A rope extending diagonally from the stern of one ship to the head of another, to make one ship sheer off to a greater distance.

In physical geography and geology, an overflow of water or other liquid. When rain falls on a porous soil it is rapidly absorbed, the surface of the soil being soon dry again. Meanwhile the water has percolated downward till it has, at a greater or less depth, been intercepted by an impervious stratum, where it gradually forms a reservoir. It then presses with great force laterally, and a system of subterranean drainage is established. If the impervious stratum be some distance up a hillside, the water finds its way out, not, however, all along the stratum, for the existence of rents, fissures, and inequalities confines it to a few spots. If the reservoir be on an elevation and a boring be made on a lower level to any of the branches leading from it, the water will rise in the bore to the surface and shoot up into the air to a height proportional to the pressure from the reservoir, as an artesian well, which is akin to a spring. Springs are of two kinds, land and perennial springs, the former existing where there is a porous soil with an impervious subsoil, the latter deriving their waters from deeper sources. Perennial springs include thermal springs and geysers. Sometimes springs contain much earthy material; thus there are calcareous, sulphurous and gypseous, siliceous, ferruginous, saline, carbonated and petroleum springs. They are then called mineral springs.

Spring, Leverett Wilson, an American educator; born in Grafton, Vt., Jan. 5, 1840; was graduated at Williams College in 1863, and took a theological course at the Hartford and Andover Theological Seminaries; was ordained in the Congregational Church, and held pastorates at Fitchburg, Mass., and Lawrence, Kan., in 1868–1881. In the latter year he accepted the chair of English literature at the Kansas State University; and in 1886 became professor of the same at Williams College. He is the author of "Kansas" (1885); "Mark Hopkins" (1888); etc.; and the editor of "The Centennial Anniversary of Williams College" (1893); and "The Addresses of President Hopkins and the Rev. Thomas Robbins at the Semi-Centennial of Williams College, 1843" (1893).

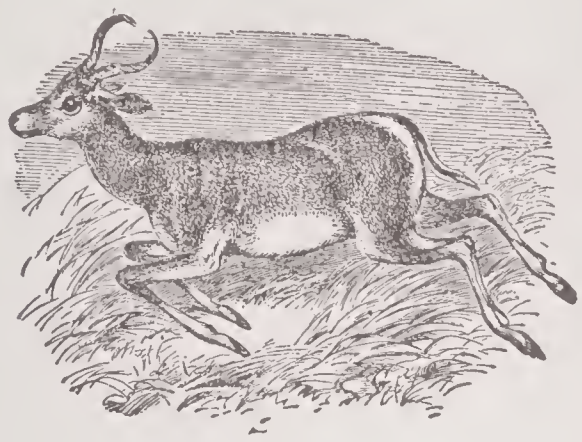
Springal, an ancient warlike engine, used for shooting large arrows, pieces of iron, etc. It is supposed to have resembled the cross-bow in its construction.

Spring Balance, a balance in which the weight of an object is determined from the tension or compression of a spring provided with an index and scale. In the ordinary form the spring is spiral and inclosed in a cylindrical box at whose upper end is a suspending ring. The hook from which the object to be weighed is suspended is connected by a rod to a piston above the spring, so that the weight has the effect of condensing the spring, a finger on the rod projecting through a long slot in the case and indicating the weight on a graduated and numbered scale. Another is in the form of the letter C, the upper end being suspended by a ring, and the lower end affording attachment for the hook whereby the object is suspended. As the bow opens a finger traverses a graduated arc and registers the weight.

Spring Balance Valve, a spiral spring weighing balance, with an index and pointer attached to the end of the lever, by which the pressure on the safety valve of a steam engine is adjusted.

Springbok, in zoölogy, the *Antilope euchore*, an antelope exceedingly common in South Africa. It is about 30 inches high, the horns lyrate, very small in the female; color yellowish dun, white beneath. Two curious folds of skin ascend from the root of the tail, and terminate near the middle

of the back; they are usually closed, but open out when the animal is in rapid motion, and disclose a large triangular white space, which is otherwise concealed.



SPRINGBOK.

Springer, in architecture, the impost or place where the vertical support to an arch terminates and the curve of the arch begins; or the lowest voussoir or bottom stone of an arch which lies immediately on the impost.

Springer, a name given to several varieties of the spaniel. The ears are long and pendulous, and the color usually white with red spots. It is employed to start or spring birds from coverts. The chief breeds are the Clumber, Sussex, and Norfolk.

Springer, Rebecca Ruter, an American author; born in Indianapolis, Ind., Nov. 8, 1832; was graduated at Wesleyan College, Cincinnati, in 1850; married William McK. Springer in 1859. Besides a volume of poems, "Songs of the Sea," she wrote the novels "Beechwood" (1873); "Self" (1881); "Intra Muros" (1898); and many magazine articles. She died in 1904.

Springer, Reuben Runyan, an American philanthropist; born in Frankfort, Ky., Nov. 16, 1800; became a clerk in the Frankfort postoffice in 1813 and postmaster in 1816. Afterward he was engaged as a clerk on a steamboat plying between Cincinnati and New Orleans. He soon bought an interest in this boat, with which he laid the foundation of his wealth. Subsequently he acquired a large interest in a flourishing grocery business in Cincinnati; but owing to ill health retired in 1840. He was a liberal supporter of charitable enterprises. His contributions include $420,000 to Cincinnati for the Art Museum, the Exposition Building, Music Hall, and Odeon Theater; $400,000 to different institutions of the Roman Catholic Church, of which he was a member; $100,000 to private charities of the same church; and $30,000 a year in other benevolences. He bequeathed about $3,000,000 to his nearest relatives, having no children, and annuities to the Art Museum, the College of Music, and the Music Hall of Cincinnati. He died in that city, Dec. 10, 1884.

Springer, William McKendree, an American jurist; born in Sullivan co., Ind., May 30, 1836; was graduated at the Indiana State University in 1858; engaged in newspaper work in 1858–1862; was admitted to the bar in 1859. He was a member of the Illinois Legislature in 1872, and a member of Congress in 1875–1895. He became a leader of the Democratic portion of that body and served as chairman of the Banking and Currency, the Ways and Means, the Territories, and other important committees. He was the author of the law known as the "Springer Bill," which gave a judicial system to the Indian Territory and established the Territory of Oklahoma. He also introduced the bill creating the States of North and South Dakota, Washington, and Montana. In 1895–1899 he was United States judge for the Northern District of Indian Territory, and chief-justice of the United States Court of Appeals for Indian Territory; then engaged in law practice in Washington, D. C. He died Dec. 4, 1903.

Springfield, a city, capital of the State of Illinois, and county-seat of Sangamon co.; on the Wabash, the Baltimore and Ohio Southwestern, the Chicago, Peoria, and St. Louis, the Chicago and Alton, the Illinois Central, the St. Louis, Peoria, and Northern, and the St. Louis, Chicago, and St. Paul railroads; 190 miles S. of Chicago. It contains the State capitol, costing $4,000,000; court house; United States government building;, the governor's mansion; the former residence of President Lincoln; the Lincoln National Monument in Oak Ridge Cemetery; State fair grounds; State Military Park, etc. Here also are Concordia College (Luth.), Bettie Stuart Institute, St. Agatha's School (P. E.), numerous libraries, State arsenal, the Prince Sanitarium, the Wabash Railroad and St. John's Hospitals, street railroad and electric light plants, waterworks, National and other banks, and numerous daily, weekly, and monthly periodicals. The trade and industry of the city are greatly promoted by rich coal mines in the vicinity. Springfield is especially noted for the extensive manufactory of the Illinois Watch Company. It also has many large printing and publishing houses, textile works, planing mills, machine shops, etc., and an assessed property valuation exceeding $5,500,000. The city was founded in 1819; became the county-seat in 1823; and received its city charter in 1840. It was made the capital of Illinois in 1837, and the Legislature convened here for the first time in 1839. Pop. (1890) 24,963; (1900) 34,159; (1910) 51,678.

Springfield, a city and county-seat of Hampden co., Mass.; on the Connecticut river, and on the New York, New Haven, and Hartford, the New York and New England, and the Boston and Hartford rail-

roads; 99 miles W. of Boston. The city is noted for its beauty, being laid out with wide streets, and having many magnificent churches and residences. Here are the French-American College, a School for Christian Workers, public library with nearly 90,000 volumes, a United States armory and arsenal, the largest in the country, United States government building, street railroad and electric light plants, National and other banks, and numerous daily, weekly, and monthly periodicals. The industries include the manufacture of firearms, by both the United States government and a private corporation, railway cars, knit goods, clothing, paper, envelopes, watches, boilers, engines, machinery, silverware, jewelry, skates, carriages, buttons, needles, toys, printed books, chemicals, etc. The assessed property valuation exceeds $74,000,000. Springfield was founded by William Pynchon with colonists from Roxbury in 1636. The Indians burned the town during King Philip's War in 1675. In Shay's rebellion in 1787 the United States arsenal was attacked, but the rebels were driven away. The city was incorporated in 1852. Pop. (1900) 62,059; (1910) 88,926.

Springfield, a city and county-seat of Green co., Mo.; on the Kansas City, Fort Scott, and Memphis, and the St. Louis and San Francisco railroads; 130 miles S. of Jefferson City. It is on the summit of the Ozark Mountains in a rich lead and zinc section, and has a healthful climate. Here are Drury College (Cong.), a normal school, high school, United States government building, street railroad and electric light plants, St. John's Hospital, National and Confederate cemeteries, National and State banks, and daily and weekly newspapers. It has two extensive railroad shops, wagon and carriage factories, a foundry and iron works, and an assessed property valuation of nearly $8,000,000. In the early part of the Civil War several battles occurred in the city and vicinity, in one of which (known as the battle of Wilson's Creek, Aug. 10, 1861), the Federal general, Nathaniel Lyon, was defeated and killed. Pop. (1890) 21,850; (1900) 23,267; (1910) 35,201.

Springfield, a village in Union co., N. J.; on the Rahway river and on the Lackawanna railroad; 8 miles S. W. of Newark. It has several churches and manufactories of paper, shoes, and hats. Springfield is celebrated as the scene of a battle between the American and British forces, June 23, 1780. The British, under General Knyphausen, advanced from Elizabethtown about 5 o'clock in the morning. They were opposed by General Greene, but owing to the superior number of the enemy he was compelled to evacuate Springfield, which was then burned by the British. During the action the Rev. James Caldwell, chaplain in the New Jersey brigade, is said to have distributed the hymn books from the neighboring Presbyterian Church among the soldiers for wadding, saying at the same time, "Now put Watts into them, boys." This battle prevented further advance on the part of the British. The American loss was about 72 and that of the British about 150.

Springfield, a city and county-seat of Clarke co., O.; on the Mad river and on the Pittsburg, Cincinnati, Chicago, and St. Louis, the Erie, Cleveland, Cincinnati, and St. Louis, and the Ohio Southern railroads; 45 miles W. of Columbus. It is in a rich agricultural section. Here are a United States government building, public library, Springfield Seminary, Wittenberg College (Luth.), waterworks, a sewer system, street railroad and electric light plants, numerous churches, several National and other banks, and daily, weekly, and monthly periodicals. The city is noted for its extensive manufacture of agricultural implements, including reapers, mowers, reaper-guards, grain separators, grain drills, and mower and reaper knives. The other manufactures are flour, bricks, lime, carriages, galvanized iron work, spring beds, linseed oil, whisky, turbine waterwheels, sewing machines, steam heaters, and stationary and portable steam engines. The assessed property valuation is nearly $18,000,000. Pop. (1890) 31,895; (1900) 38,895; (1910) 46,921.

Spring Gun, a gun having wires connected with its trigger, and so fixed and planted that when wild animals, trespassers, etc., stumble against the wire the gun shall be discharged at them so as to wound them. It is generally illegal to set man traps or spring guns save indoors as a defense against burglars.

Spring Hill College, an educational institution in Mobile, Ala.; founded in 1836 under the auspices of the Roman Catholic Church; reported at the close of 1901: Professors and instructors, 20; students, 154; volumes in the library, 25,000; grounds and buildings valued at $500,000; benefactions, $1,000; income, $43,000; number of graduates, 435; president, Rev. William J. Tyrrell, S. J.

Spring Hill, Fort. See HARRISON, FORT (Va.).

Springing, in heraldry, a term applied to beasts of chase in the same sense as salient to beasts of prey. Also applied to fish when placed in bend.

Springtails, a family of apterous insects belonging to the order *Thysanura*, and distinguished by the possession of an elastic forked caudal appendage which is folded under the body when at rest, and by the sudden extension of which they are enabled to make considerable leaps; hence their popu-

lar name of springtails. Their scales are favorite test objects for microscopes.

Spring Tide, the tide which happens at or soon after the new and full moon, which rises higher than common tides. At these times the sun and moon are in a straight line with the earth, and their combined influence in raising the waters of the ocean is the greatest, consequently the tides thus produced are the highest. See TIDE.

Sprit, a small boom, pole, or spar which crosses the sail of a boat diagonally from the mast to the upper aftmost corner, which it is used to extend and elevate. Such a sail is called a sprit sail. The same name was formerly given to a sail attached to a yard under the bowsprit of large vessels.

Sproull, William Oliver, an American educator; born in Allegheny, Pa., May 8, 1848; was graduated at Washington and Jefferson College in 1869, and then studied abroad. He became Professor of Latin and Arabic at the University of Cincinnati in 1880; and was professor in the Bay View Summer School in 1895–1896. He is the author of "An Extract from Ibn Kutaiba's Adab-al-Katib: or, The Writer's Guide" (1887); and essays including: "The Education of the Roman Youth" (1890); "Unciales Literæ" (1892); "The Degree of the Doctor of Philosophy" (1893); "The Teachers in the Public Schools and University Extension" (1893); "Paul's Knowledge of Roman Law"; etc.

Spruce Beer, a drink made from the spruce tree. The essence of spruce is obtained by boiling the green tops of the black spruce (*Abies nigra*) in water, and then concentrating the decoction by another boiling without the spruce tops. The young shoots of this fir, like most others of its family, are coated with a resinous exudation which is dissolved in the water. Spruce beer is made by adding the essence of spruce to water in which sugar or treacle has been dissolved, in the proportion of about four ounces of essence of spruce to 10 pounds of sugar or three quarts of treacle and 10 or 11 gallons of water, with about half a pint of yeast. Various spices are used for flavoring. A similar beverage is made largely in the N. of Europe from the buds of the Norway spruce (*Abies excelsa*), and is known as black beer, that of Danzig being the most famous.

Spruce Fir, in botany, a popular name for many species of the genus *Abies*, specifically *A. excelsa*, a fine evergreen which sometimes reaches a height of 150 feet, with a straight, though not very thick trunk and a regular pyramidal form. Leaves scattered equally round the twigs; four-cornered, mucronate, dull green; cones cylindrical, pendulous, with blunt, sinuate, slightly toothed scales. It is a native of the N. of Germany and Norway, whence it is often called the Norway spruce. It is commonly planted in Southern Europe, and affords an excellent shelter for game. Its timber is the white deal of commerce. It is not so durable as the Scotch pine, but is prized for masts, spars, scaffolding poles, etc. In Norway it takes 70 or 80 years to arrive at maturity. By incision it yields a resin whence turpentine and Burgundy pitch are manufactured.

The white spruce fir (*A. alba*) has the leaves somewhat glaucous, rather pungent; the cones narrow, oval, tapering, with even, undivided scales. It is found in North America, where it reaches the height of 40 to 50 feet. The black spruce is *A. nigra*, from the very cold parts of North America. The leaves are short, the cones ovate oblong, obtuse, with ragged, round scales. It grows to 70 or 80 feet high. The timber is very valuable. The black spruce of British Columbia is *A. menziesii*. The red spruce (*A. rubra*) is also North American. It is about 50 feet high, and its timber is used for sail yards.

Sprunger von Mertz, Karl, a German cartographer; born in Stuttgart, Nov. 15, 1803; joined the army of Bavaria; and taught geography in the Bavarian cadet college from 1855. His name is associated with a well-executed and painstaking and accurate "Historico-Geographical Atlas" in three parts (1853–1864), embracing in all 139 maps; besides this he published historical atlases of Bavaria (1838), Austria (1860), and Germany (1866), and a few historical works dealing with Bavaria. He received the rank of general-lieutenant in 1869, and retired in 1886. He died in Munich, Aug. 2, 1892.

Spuilzie, the name given in Scotch law to the violent removal of the goods of another without legal warrant or authority. The person thus acting may be sued not only for the recovery of the goods, but for all the profits that might have accrued to him from their use.

Spun Yarn, a small line or cord, formed of two, three, or more rope yarns twisted together. The yarns are usually drawn out of the strands of old cables and knotted together. Spun yarn is used for various purposes, as serving ropes, weaving mats, etc.

Spur, a metal instrument composed of a shank, neck, and prick or rowel, fastened to the heel of a horseman to goad his horse to greater speed. Its use cannot with certainty be traced further back than Roman times. Early spurs had no neck, a prick being riveted to the shank. Prick spurs had straight necks in the 11th century and bent ones in the 12th. Rowels first appeared early in the 14th. The neck was then short and inclined downward, but in the succeeding centuries it was made straight and very long, while the rowels bore from 12 to 18 points. The spur afterward was shortened,

and the fashion in rowels of different forms changed very much. The spurs of mediæval knights were gilt and those of esquires silvered. "To win his spurs" meant to gain knighthood.

Spurge, a vast genus (upward of 700 species) of herbs, shrubs, or soft-wooded trees with fleshy branches, abounding in milky juice. An extensive group, abounding in South Africa, have succulent, spiny, or unarmed, often melon-shaped or cactus-like stems. The flower heads resemble single flowers, consisting of a calyx-like cap-shaped involucre, with 4–5 teeth, alternating with as many large horizontal glands, which enclose 10–15 male and 1 central female flower; the capsule separating when ripe into its three 2-valved constituent carpels. The genus is represented in all climates excepting the Arctic. Eleven non-important species are natives of Great Britain, and three others are more or less naturalized. Of the latter the caper spurge (*E. Lathyris*) has seeds containing a powerfully purgative oil. The most noteworthy medicinal species are *E. resinifera,* furnishing the intensely acrid gum-resin known in commerce as euphorbium, used principally as a vesicant in veterinary practice; *E. ipecacuanha* of North America — called wild ipecac — the root bark of which possesses emetic, expectorant, and cathartic properties; *E. corollata,* of which the root is officinal in the United States pharmacopœia as an emetic; and *E. neriifolia* of India, yielding a juice employed externally in native medicine, while the root is used as a remedy in snake bites. Various species with brilliant scarlet bracts are grown for ornament.

Spurge Laurel, the *Daphne Laureola,* a shrub possessing acrid properties, flowering in March and April.

Spurgeon, Charles Haddon, an English preacher; born in Kelvedon, England, June 19, 1834. In 1850 his sympathies drew him toward the Baptists, and, removing to Cambridge in 1851, he began to deliver cottage sermons in the neighborhood. At the age of 18 he had charge of a small Baptist congregation in the village of Waterbeach. In 1854 he entered on the pastorate of the New Park Street Chapel, London, where his preaching proved so attractive that in two years' time the building had to be greatly enlarged. His hearers continuing to increase, the Surrey Music Hall was for some time engaged for his use; and finally his followers built for him his well-known "Tabernacle" in Newington Butts, opened in 1861. The evangelistic and philanthropic agencies in connection with this immense chapel comprise the Stockwell Orphanage, a pastors' college, where hundreds of young men are trained for the ministry; the Golden Lane Mission, etc. Spurgeon preached in the Tabernacle every Sunday to thousands of hearers. His sermons were published weekly from 1854, and yearly volumes were issued from 1856. They had an enormous circulation, many of them being translated into various languages. He wrote: "John Plowman's Talk," "Morning by Morning," "Evening by Evening," "The Treasury of David," "Lectures to My Students," "The Saint and his Saviour," etc.; and from 1865 edited a monthly magazine, "The Sword and the Trowel." He died in Mentone, France, Jan. 31, 1892.

Spurrey, the common name for *Spergula,* a genus of plants, natural order *Caryophyllaceæ.* The species are found in fields and cultivated ground, especially on sandy soils, all over the world. They have slender stems, very narrow often whorled leaves, and small white fine-petaled flowers. *S. arvensis* (corn spurrey or yarr) is a well-known plant growing in cultivated grounds from Canada to the State of Georgia. Cattle and sheep are fond of it; hens also eat it.

Spur Royal, a gold coin first made in the reign of Edward IV. In the reign of James I. its value was about $3.65. So called from having on the reverse a sun with four cardinal rays issuing from it, so as to support a resemblance to the rowel of a spur.

Spur Wheel, in machinery, a wheel in which the teeth are perpendicular to the axis and in the direction of radii. A train of such wheels working into each other is called spur gear.

Spur Wing, the common name for a species of wading birds of the genus *Parra,* having the wing armed with a bony spur. They inhabit Africa and South America. The name is also given to the species of geese of the genus *Plectropterus.* They are natives of Africa, and have two strong spurs on the shoulder of the wing.

Spurzheim, John Gaspar, a German phrenologist; born in Longwich, near Treves, Prussia, Dec. 31, 1776, and became acquainted with Dr. Gall at Vienna, where he studied medicine. From 1805 till 1813 he was the constant companion of Gall in his travels and scientific researches, and subsequently became an active promulgator of the new doctrine in England and France. One of his distinct claims is that of having demonstrated the fibrous structure of the brain. He wrote numerous books, including: "Phrenology" (1825); "Philosophical Principles of Phrenology" (1825); "Manual of Phrenology" (1832); and some others on more general topics — *e. g.,* "Elementary Principles of Education" (1821), and "Essay on the Moral and Intellectual Nature of Man." He died in Boston, Mass., Nov. 10, 1832.

Spy, a secret emissary sent into the enemy's camp or territory to inspect their works, ascertain their strength and their intentions, to watch their movements, and report thereon to the proper officer. By the laws of war among all civilized nations a spy is subjected to capital punishment. To be treated as a spy one must first be caught in the enemy's territory, and in dress other than the adopted military uniform of his country. It must also be clearly shown that the object of the accused person is to gain information for the enemy which it would be to their advantage to know. If, when captured, the prisoner can show that his errand in getting through was of a personal nature, or that he was trading with the enemy, he can only be held as a prisoner of war. In trying a spy his military rank counts for much. An officer of high rank receives a more thorough trial than a private, though both are tried by court-martial. In the United States the verdict is sent to the President or the Secretary of War or Navy, for approval before execution. When a spy is caught in the act all these formalities are omitted. He is tried by a drum-head court-martial composed of the first five or more officers handy; he is allowed to make an explanation and a verdict is rendered without much deliberation. If he is found guilty the verdict is sent to the highest commanding officer in camp, and on his approval the sentence is carried out, after which a full report is made to the President. The two most famous spies in American history are Nathan Hale and Maj. John Andre, both of whom were captured when about to pass with their information mation back to their own lines, and the evdence against both was conclusive. Hale received only a trial by drum-head court-martial, while Andre had every opportunity to prove his innocence.

Spy Wednesday, an old name given to the Wednesday immediately preceding Easter, in allusion to the betrayal of Christ by Judas Iscariot.

Squad, a small body of troops assembled for drill, inspection, or other purposes. The awkward squad is composed of those recruits who have not received sufficient training to take part in regimental drill.

Squadron, in military language, a force of cavalry commanded by a captain, and averaging from 120 to 200 men. Each squadron is composed of two troops, each commanded by a captain for purposes of administration, but united under the senior for service in the field. Four squadrons form a regiment. The squadron is frequently considered the tactical unit of cavalry. As a naval term, a division of a fleet; a detachment of ships of war employed on a particular service or station, and under the command of a junior flag officer.

Squalidæ, a family of elasmobranchiate fishes, which includes the various species of sharks. The type of this family is the Linnæan genus *Squalus.* See SHARK.

Squalodontidæ, in palæontology, a family of *Odontoceti,* consisting of a single genus, *Squalodon,* founded for the reception of numerous extinct forms — chiefly teeth and fragments of crania — widely distributed throughout the Marine Miocene and early Pliocene of Europe, North America, and South Australia. The teeth are in groups, as in Zeuglodon, the posterior molars with two roots; the cranium is essentially odontocete.

Squalus, in ichthyology, a Linnæan genus of amphibia, with five lateral spiracles. It was approximately equivalent to the modern *Selachoidei,* and, in a more or less modified form, found a place in several classifications, but has now lapsed.

Squama, an order of skin diseases in which a morbid secretion of the epidermis produces scales or scurf, readily detached, but reproduced again and again by desquamation; the scales are degenerated, thickened, dry epidermis covering minute papular elevations of the skin. Local heat and itching are present, but there is no constitutional disturbance. The order comprehends psoriasis, including lepra, pityriasis, and ichthyosis. None is contagious.

Squamata, the division of reptiles comprising the *Ophidia* (snakes) and *Lacertilia* (lizards), in which the integument develops horny scales, but there are no dermal ossifications.

Squamipennes, a family of acanthopterygious (teleostean) fishes, so named on account of their fins being covered with scales, not only on the parts which have soft rays, but frequently also on those that have spinous ones. They are chiefly small fishes, abundant in the seas of hot climates, and of the most beautiful colors. They frequent rocky shores, and their flesh is, generally speaking, very wholesome and palatable. Called also *Chætodontidæ.*

Square, in geometry, a quadrilateral figure, both equilateral and equiangular, or, in other words, a figure with four equal sides and equal angles. In measuring superficial areas it is only necessary to multiply one side by itself to have the area of the square, because each of the sides may be considered as the basis or as the perpendicular height. Thus a square the sides of which measure 4 feet is equal to 16 square feet, that is, 16 squares each 1 foot high and 1 foot long. To square a figure (for example, a polygon) is to reduce the surface to a square of equivalent area by mathematical means. It has often been attempted to square the circle, but this has been proven impossible. In arithmetic and

algebra the square of a number is the number or quantity produced by multiplying a number or quantity by itself. Thus 64 is the square of 8, for $8 \times 8 = 64$.

Square, in military tactics, a body of infantry formed into a rectangular figure with several ranks or rows of men facing on each side, with officers, horses, colors, etc., in the center. The front rank kneels, the second and third stoop, and the remaining ranks (generally two) stand. This formation is usually employed to resist a cavalry charge. Hollow squares are frequently formed with the faces fronting inward when orders and instructions, etc., are to be read, and the like.

Square Rigged, a term applied to a vessel carrying chiefly square sails, that is, whose principal sails are extended by yards suspended by the middle, and not by stays, gaffs, booms, and lateen yards. Thus a ship and a brig are square rigged vessels.

Square Root, in mathematics, a quantity which, being taken twice as a factor, will produce the given quantity. Thus, the square root of 25 is 5, because $5 \times 5 = 25$; so also 2-3 is the square root of $\frac{4}{9}$, since $\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$; x^2 is the square root of x^4, since $x^2 \times x^2 = x^4$; $a + x$ is the square root of $a^2 + 2ax + x^2$, and so on. When the square root of a number can be expressed in exact parts of 1, that number is a perfect square, and the indicated square root is said to be commensurable. All other indicated square roots are incommensurable.

Square Sail, a four sided sail, whose middle position is athwartship. It is supported by a yard, slung at its mid-length by a truss or parrel. It is distinguished from sails which are extended by stays, booms, gaff's lateens, sprits, etc. Also a sail set across the foremasts of schooners, the masts of sloops and cutters, when sailing before the wind in light weather.

Squares, Method of Least, an arithmetical process of great importance for combining observations, or sets of observations, so as to obtain the most probable value of a quantity which depends on these observations. It is in fact the scientific method of taking certain averages, and it finds its most constant use in astronomy and other physical sciences. The necessity for applying the method arises from the fact that when the greatest precision of measurement is sought, repeated measurements of the same quantity do not agree. Thus, the altitude of a star at culmination, if carefully measured night after night by the same observer through the same instrument, will in general come out a little different in the different observations. All the measurements will, however, lie within a certain range of variation; and if all are equally trustworthy, the arithmetical mean will give the most probable value of the real altitude. The differences between this mean and the individual measurements on which it is founded are called the residuals. The important mathematical property of these residuals is that the sum of their squares is less than the sum of the squares of the differences between the individual measurements and any other single quantity that might be taken. Now, this principle of "least squares" holds not only for the simple case just described, but also for more complicated cases in which one observed quantity (y) is to be expressed as an algebraic function of another or of several independently observed quantities (x). Here the object is to find the most probable values of the assumed constants or parameters which enter into the formula. When these values are calculated we can calculate in terms of them and the observed x's a value of y corresponding to each set of observations. Comparing the calculated y's with the observed y's, we get a set of residuals the sum of whose squares is a minimum if the parameters have been calculated according to a particular process. It is this process which is described as the method of least squares. Its basis is found in the mathematical principles of probability.

Squarson, a dignitary of the Church of England, who is also the squire of the parish. The formation of this word has been attributed to Sydney Smith, Theodore Hook, and Dr. Wilberforce, Bishop of Oxford, and afterward of Winchester, who is also credited with the formation of "squishop."

Squash, in botany and horticulture, a popular name for any species of the genus *Cucurbita;* specifically, *C. melopepo.* Leaves cordate, obtuse, somewhat five-lobed; tendrils denticulated, or converted into small leaves; calyx with the throat much dilated; fruit flattened at both ends, with white, dry, spongy fruit which keeps fresh for many months. It is boiled and eaten with meat.

Squash Bug, a name given in North America to several hemipterous insects, best known as destroyers of squash, pumpkin, and other plants.

Squatina, a genus of cartilaginous fishes somewhat akin to the rays. The *S. angelus* is the angel fish or monk fish.

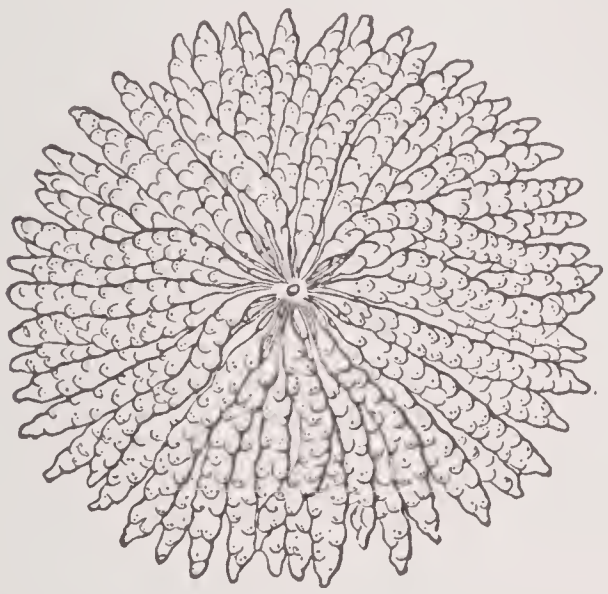
Squatter, one who without a title settles on new or uncultivated land. In the early days of the United States its meaning was confined to the foregoing sense. In Australia, one who occupies an unsettled tract of land; as a sheep farm under lease from government at a nominal rent.

Squaw Berry, in New England the fruit of the wintergreen is sometimes called squaw berry; but in Utah, Arizona, Southern California, and New Mexico the name is given to

the fruit of a shrub five to eight feet high, out of the twigs of which the Indians make their baskets. This fruit, which is red and very sour, is gathered in the summer in great quantities by the Indian squaws, and is eaten both fresh and dried. A very pleasant drink also is made by washing the berries in water. The twigs, which are tougher and more durable than willow, have a peculiar scent which never leaves articles made of it. Baskets made of them are very strong, will hold water, and are even used to cook in, hot stones being dropped in from time to time till the food is done.

Squaw Root, a singular scaly plant (*Conopholis americana*, natural order *Orobancheæ*), a native of America, found growing in clusters among fallen leaves in oak woods.

Squeteague, in ichthyology, the *Otolithus regalis*, found in Long Island Sound and the Gulf of St. Lawrence. It is from



SPAWN OF THE SQUID.

one to two feet long, brownish-blue above, with irregular brownish spots, sides silvery, belly white. The flesh is wholesome and well-flavored, but so quickly gets soft that it does not rank high in the market. The air bladder makes excellent isinglass. It is a voracious fish and bites readily, but its mouth is easily torn, whence it is often called weak fish.

Squid, a popular name of certain cuttle fishes belonging to the dibranchiate group of the class *Cephalopoda*, and included in several genera, of which the most familiar is that of the calamaries.

Squib, a little pipe or hollow cylinder of paper filled with gunpowder or other combustible matter which being ignited it flies along, throwing out a train of fiery sparks, and bursting with a crack.

Squier, Ephraim George, an American archæologist; born in Bethlehem, Pa., June 17, 1821. While a journalist at Chillicothe, O., he prepared an account of discoveries in ancient mounds (he being the principal authority on the subject) for the "Smithsonian Contributions to Knowledge" (1848). He was chargé d'affaires to the Central American States (1849), consul-general to Peru (1863), and to Honduras (1868). Besides many reports and contributions to periodicals and scientific journals, he published: "Aboriginal Monuments of the State of New York" (1851); "Serpent Symbols" (1852); "Nicaragua" (1852); "Notes on Central America" (1854); "States of Central America" (1857); "Tropical Fibers" (1861); "Peru: Incidents and Explorations" (1877). He died in Brooklyn, N. Y., April 17, 1888.

Squill (*Scilla*), a genus of *Liliaceæ* numbering about 72 known species of bulbous plants with radical linear leaves; usually blue flowers (rarely purple or white), in racemes on leafless scapes; perianth segments six, free or nearly so; capsule three-angled, loculicidally three-valved, seeds small, swollen. The genus is confined to the Old World. Three are British. *S. autumnalis*, in which the leaves are autumnal, succeeding the flowers, is confined to a few counties in Southern England; while *S. verna*, with leaves appearing in spring in

A, SCILLA VERNA; B, OFFICINAL SQUILL, URGINEA SCILLA.

a, plant with flowering scape in blossoms; b, plant with full-grown leaves. (From Bentley and Trimen.)

anticipation of the light-blue fragrant flowers, is met with in localities near the coast between Cornwall and Shetland. The third is the familiar wild hyacinth often called "bluebell" in England, the "English Iacint" of old writers, the *Hyacinthus non-scriptus* of Linnæus, now named *S. nutans*.

It is common from Ross S., often occurring in such profusion as to render large tracts of woodland a sheet of blue from April to June.

The medicinal squill belongs to an allied genus of the tribe *Scilleæ*, named *Urginea*, comprising 24 species spread through the whole of Africa, and reaching Hindustan and Southern Europe. It is the species known as *U. scilla* or *maritima* (formerly *S. maritima*), a native of the coast district from Syria to the Canaries, appearing also in the Cape flora. From a bulb of four to six inches in diameter leaves are produced in spring, followed in autumn by a raceme of whitish flowers borne by a round scape of one to three feet high. For the preparation of the drug the bulbs are dug up, divided into four parts, the center portion and outer scales removed, and the remainder cut into slices and gently dried. In this state it reaches the druggist's shop. Medicinally, squill is used as a diuretic in certain forms of dropsy, and as an expectorant. In large doses it causes vomiting, and in extreme quantity acts as a narcotico-acrid poison.

Squilla, or **Scilla,** in zoölogy, a genus of *Stomapoda*, with several species, of which the best known is *S. mantis*, with a number of popular names. Segments much less coalescent than in the lobster; those bearing the eyes and antennules are readily separable from the front of the head, and are not covered by the carapace, which only conceals eight segments. The gills are borne by the abdominal swimming feet, free and uncovered. The first pair of thoracic limbs are developed into a pair of formidable claws, the terminal joint of which bears a row of long, sharp, curved teeth, doubling back on the edge of the penultimate joint, which has a groove to receive them. They lay their eggs at the bottom of the sea, and the larvæ pass into forms which have been described as independent genera.

Squill Insect, an unidentified aquatic animal. Moufet, "Theater of Insects," says, "The squilla, an insect, differs but little from the fish squilla," a word which he uses as synonymous with shrimp. But by early writers names were loosely applied, and from Grew we learn that squilla was applied also to what he calls rough-horned lobster (probably *Palinurus vulgaris*).

Squinch, in architecture, a small pendentive arch formed across the angle of a square tower to support the side of a superimposed octagon. Also called a sconce.

Squint, in architecture, an oblique opening passing through the walls of many old churches, usually constructed for the purpose of enabling a person in the transepts or aisles to see the elevation of the host at the high altar. Generally they are not above a yard high and two feet wide, but sometimes they form narrow arches 10 or 12 feet in height, as at Minster-Lovell, Oxfordshire. The name hagioscope is sometimes applied to them.

Squinting, a disease of the eyes in which they do not move in harmony with each other; hence the optic axes are not parallel, and a disturbance of vision is the consequence. Squinting may be confined to one eye, or it may affect both, and it may be in any direction. If the sight of both eyes is equally good, or nearly so, then all objects are seen double; but if the sight of one is much better than that of the other, the mind only attends to the more vivid impression and disregards the weaker. Squinting is owing to some affection of the nerves or muscles of the eye. In most cases it admits of cure by the operation of dividing the muscle by which the distortion is produced. See Eye.

Squire, an attendant on a knight; a knight's shield or armor-bearer. (2) An attendant on a person of noble or royal rank; hence, colloquially, an attendant on a lady; a beau, a gallant; a male companion, a close attendant or follower. (3) The title of a gentle next in rank to a knight. (4) A title popularly given to a country gentleman. (5) A title given to magistrates and lawyers in the United States. In New England it is given especially to justices of the peace and judges; in Pennsylvania to justices of the peace only.

Squirrel, in zoölogy, a popular name for any of the *Sciuridæ;* widely distributed in America, Europe, the Caucasus, Southern Siberia, and probably in Persia. It is a little animal with bright black eyes; from

COMMON SQUIRREL.

8 to 10 inches in length, with a bushy tail nearly as long; color gray or reddish-brown, white beneath, but the hue varies with the seasons, in Lapland and Siberia the upper surface becomes gray, and in Central Europe

is sprinkled with gray in the winter. Squirrels haunt woods and forests, nesting in trees, and displaying marvelous agility among the branches. They feed on nuts, acorns, beech mast, which they store up, birds' eggs, and the young bark, shoots, and buds of trees, doing no small amount of damage. They pass the winter in a state of partial hibernation, waking up in fine, warm weather, when the provision laid up in the summer is made use of for food. They are monogamous, and the female produces three or four young, usually in June. In Lapland and Siberia they are killed in great numbers for the sake of their winter coat. This, though valuable, is inferior to the fur of the North American gray squirrel (*S. carolinensis*).

Squirrel Corn, the American name for the fragrant plant *Dicentra canadensis*, natural order *Fumariaceæ* or fumitory.

Squirrel Flying-phalanger, in zoölogy, the *Petaurus sciureus;* from South Australia, about eight or nine inches long, with a tail as long as the body. Color, ash-gray with a black stripe from the nose to the root of the tail, cheeks white with a black patch, under surface white.

Squirrel Monkey, the *Callithrix sciureus*, from South America. It is about 10 inches long, with a tail half as much again; fur olive-gray on the body, limbs red, muzzle dark. They are affectionate and playful in disposition.

Squirting Cucumber, one of the popular names of the fruit of *Ecballium agreste*, a plant of the gourd family inhabiting Europe, which, when nearly ripe, separates suddenly from the peduncle, at the same time ejecting its juices and seed.

Sráddha, or **Shradh,** the funeral ceremonies in the Hindu ritual, which are of great importance both religious and legal, and it is through their performance that the soul of the departed obtains rest and the succession of property is transmitted to the heir. The sráddha proper, which is in fact a worship of departed ancestors, commences on the 11th day after death, the interval having been occupied with minor ceremonies personal to the deceased. Its essential feature consists in offering *pindas* or balls of rice to the spirits of all those who are recognized as agnates. It is accompanied by much feasting and costly gifts to the Brahmans invited to assist at the celebration, and is sometimes repeated at stated periods. Wealthy families pride themselves on spending large sums of money on this account.

Srinagar, a city and capital of the State of Kashmir, in the Western Himalyas, situated in the valley of Kashmir, on both banks of the Jehlum. The city extends along the river for about 2 miles, and is exceedingly picturesque, though on nearer approach the streets are found to be narrow and dirty. The Jama Masjid, a large mosque said to be capable of containing 60,000 persons, is situated in the city and in the environs are beautiful gardens and the lake mentioned in Moore's "Lalla Rookh." Srinagar has manufactures of shawls, paper, leather, firearms, otto of roses, etc. Pop. (1901) 122,618.

Staal, Marguerite Jeanne, Baroness de, a French author; born in Paris, May 30, 1684, the daughter of a poor painter named Cordier, whose name she dropped for that of her mother, Delaunay. She had a sound education at the convent of Saint Louis at Rouen, and at 27 was attached to the person of the imperious and intriguing Duchesse de Maine at the little court of Sceaux. Here she saw before her eyes all that comedy of life which she was later to describe with such penetrating insight. Her position was at first a servile one, and she must often have been sorely tried by the temper of her mistress, but in herself remained not one whit of what she calls the "*caractère indélébile de femme de chambre,*" and all her life was ruled in harmony with her own words, that it is only our own actions which can degrade us. Her devotion to the interests of the duchesse brought her two years in the Bastille, where she had a love affair with the Chevalier de Menil. In 1735 she married Baron de Staal, an officer of the Guard. Her "Mémoires" (4 vols. 1755), show intellect and observation, as well as remarkable mastery of subtle irony, and are written in a style clear, firm, and individual. Her "Complete Works" appeared at Paris in two volumes in 1821. She died in Paris, June 16, 1750.

Stabat Mater, in music, a well-known Latin hymn on the Crucifixion, sung during Passion week in the Roman Church. Jacopone, a Franciscan who lived in the 13th century, is supposed to have been the author of the words. In addition to the ancient setting, probably contemporary with the words, many composers have written music to the Stabat Mater, but the compositions which are best known are those by Palestrina, Pergolesi (the last effort of his life), and Rossini. The hymn has been translated into English by Bishop Mant ("By the Cross sad vigil keeping," etc.) and the Rev. E. Caswell ("At the Cross her station keeping," etc.), and is sung in the Roman Catholic Church on the Feast of the Seven Dolors in Holy Week, and during the Devotions for the Way of the Cross.

Stability, the name given to the property possessed by all material systems whose configuration remains permanent or never departs far from a permanent average type. There are two kinds — static and kinetic. Of static stability, or stable equilibrium,

we have numerous examples of a simple character, as a pendulum or any body hanging under the influence of gravity by a point which is not its center of mass. If any displacement (within certain limits) is given to the body, it will, when released, tend to recover its original condition. In dynamic language the forces brought into play by the displacement resist it. If, however, the ball is placed on the top of a convex surface, or if a chair, for example, is tilted till the vertical line through its center of mass falls outside the original area of its base, then the configuration is no longer stable. Both bodies will fall away from these positions till a new configuration of stable equilibrium is reached. In general, stability is proved by a system recovering its configuration after a slight displacement. Instability is demonstrated when any slight displacement is followed by a complete change of configuration, forces being brought into existence which assist the displacement. When a displacement brings into play no forces, so that the system tends neither to recover nor to fall away from its original configuration, the equilibrium is said to be neutral or labile. A uniform sphere resting on a plane is a simple example of this kind of equilibrium.

In kinetic stability, or stability of steady motion, a new factor comes into play. Neither a spinning top nor a bicycle can rest upright unless it is in more or less rapid motion. The moon would fall into the earth, and the earth into the sun, if it were not for the orbital velocity sustaining each in its path. The perturbations produced by the planets cause the earth to be constantly deviating from its mean orbit; yet in virtue of kinetic stability this deviation is never large, and takes place now in one direction, now in another. If no frictional effects existed in the solar system, all the planetary orbits would never vary beyond certain assignable limits.

Staccato, in music, detached, taken off, separated. In music the word signifies a detached, abrupt method of singing or playing certain notes, by making them of less duration than they otherwise would be. A heavy accent (') over a note signifies that it is to be played staccato, and a dot (.) under a note, that it is to be played half staccato.

Stachydeæ, or **Stacheæ,** in botany, a tribe of *Lamiaceæ*. Stamens four, parallel, two upper shorter, ascending under the concave upper lip, or included in the tube; nutlets free, smooth, or tubercled.

Stachys, a genus of plants of the natural order *Labiatæ*, containing a great number of species, mostly European, having a ten-ribbed calyx, with five nearly equal teeth, the upper lip of the corolla entire, and the lower lip three-lobed. Several species are natives of Great Britain. *S. sylvatica* is very common in shady places, a coarse herbaceous plant, sometimes called hedge nettle, with stem two to three feet high, ovate heart shaped leaves on long stalks, whorls of purple flowers, and unpleasant smell. *S. palustris* is another very common species, growing in moist places, and sometimes proving a very troublesome weed in meadows. The plant was formerly used as a vulnerary, and has therefore the English name woundwort. Several species are not infrequently to be seen in flower gardens. To this genus some botanists refer the common betony or wood betony (*S. betonica*, or *Betonica officinalis*), plentiful in woods and thickets, a plant one or two feet high, with hairy stem, oblong heart shaped leaves, whorls of purple or white flowers, and a fetid smell. It was formerly much used in medicine. The roots, in small doses, are emetic and aperient.

Stachytarpha, or **Stachytarpheta,** in botany, a genus of *Verbeneæ;* aromatic herbs or shrubs with fleshy spikes, stamens four, the upper two without anthers; nutlets two. The Brazilians attribute powerful medicinal properties to *S. jamaicensis*. Its leaves are sometimes used to adulterate tea.

Stack Stand, a basement of wood or iron raised on props (of iron, stone, or wood), on which a stack, especially a stack of some kind of grain, is built for the purpose of keeping it dry or excluding vermin. There is usually also a hollow upright cone of wood or iron to assist in ventilating the interior of the stack.

Stacte, one of the sweet spices which composed the holy incense of the ancient Jews. Two kinds have been described, one the fresh gum of the myrrh tree (*Balsamodendron Myrrha*), mixed with water and squeezed out through a press; the other kind, the resin of the storax (*Styrax officinale*), mixed with wax and fat.

Stade, an ancient town of Hanover; near the mouth of the Schwinge, a tributary of the Elbe, 22 miles W. by N. of Hamburg. There are large brick works. The stade dues were a toll charged by the Hanoverian government on all merchandise carried up the Elbe to Hamburg. First formally recognized in 1691, they gradually increased till they brought a revenue of $200,000 a year. They were abolished in 1861, Hanover receiving $2,143,000 as compensation, of which Great Britain and Hamburg contributed each $777,775.

Stadium, in Greek antiquities, a measure of 125 geometrical paces or 625 Roman feet, 606 feet 9 inches of English measure, and thus somewhat less than an English furlong. It was the principal Greek measure of length. Also the course for foot races at Olympia in Greece, and elsewhere.

It was exactly a stadium in length. In pathology, a stage or period of a disease.

Stadtholder, a title given in the Netherlands to a governor of a province who was also commander-in-chief of the forces. This title, however, received its special significance in 1580, when the provinces of Holland and Zealand revolted against the authority of Spain, and unitedly accepted William, Prince of Orange, as their stadtholder. The prince was assassinated before he was formally invested with his office, but the title was conferred on his son, Prince Maurice, and remained as the hereditary title of the chief of the state till Holland was annexed by France in 1802. This title was finally dropped in 1814, when the Prince of Orange was recalled from England and declared King of the Netherlands by an assembly of notables. See NETHERLANDS.

Stael-Holstein, Anne Louise Germaine, Baroness de, a French author; born in Paris, April 22, 1766, where her

MME. DE STAEL-HOLSTEIN.

father, M. Necker, afterward the celebrated minister of France, was then a banker's clerk. At the age of 20 she became the wife of Baron De Staël-Holstein, the Swedish ambassador at Paris; and the strong literary turn which she had already exhibited now developed itself still further, and produced, in the course of her life, a series of works embracing almost every sort of composition in prose or verse. At first sanguine in the cause of the Revolution, she soon became warmly interested in the sufferings of its victims, especially the queen, whom she had the courage to defend in print. In 1800 she began the series of her works on speculative philosophy, by publishing her essay "Literature Considered in its Connection with Society"; and her very equivocal novel "Delphine" appeared in 1802. In that year her husband died. Madame de Staël was much too independent to be acceptable to Napoleon, who banished her from Paris, and afterward ordered her to confine herself to her château at Coppet, on the Lake of Geneva. From 1803 till 1815 she traveled much in Germany, Italy, and England, and visited Sweden and Russia. Her "Corinne," in form a novel, and the most eloquent of all tributes to the antiquities and scenery of Italy, appeared in 1807. Her most ambitious work, "On Germany," printed at Paris in 1810, was seized by the police, and was only published in London some years later. After the second restoration she lived chiefly in Switzerland, where she contracted a secret marriage with M. de Rocca. After her death, useful contributions were made to the history of the times by the publication of her "Thoughts on the French Revolution" and her "Ten Years of Exile." She died in Paris, July 14, 1817.

Staff, a body of officers whose duties refer to an army or regiment as a whole, and who are not attached to particular subdivisions.

Staff, a kind of artificial stone used for covering and ornamenting buildings. It is made chiefly of powdered gypsum or plaster of Paris, with a little cement, glycerin, and dextrine, mixed with water until it is about as thick as molasses, when it may be cast in molds into any shape. To strengthen it coarse cloth or bagging, or fibers of hemp or jute, are put into the moulds before casting. It becomes hard enough in about a half hour to be removed and fastened on the building in construction. Staff may easily be bent, sawed, bored, or nailed. Its natural color is murky white, but it may be made of any tint to resemble any kind of stone, and may be painted and gilded. It is fire-proof and water-proof and if cared for will last a long time, as it may be easily repaired with a trowel and a pailful of the mixture.

Staff was invented in France about 1876 and was used in the construction and ornamentation of the buildings of the Paris Expositions of 1878 and of 1890. It was also largely used in the construction of the buildings of the Columbian Exhibition at Chicago in 1893, and at the Omaha and Buffalo Expositions in 1898 and 1900. Without this cheap and easily worked material the great and splendid buildings would have been impossible, for they were little more than skeletons of iron and timber covered with staff. All the beautiful columns with their elaborate capitals, the pediments, friezes, and other ornaments, and even the statues and great statuary groups were covered with staff.

Staffa, a celebrated island on the W. of Scotland; 4 miles S. W. of Ulva, 6 N. by E.

of Iona, and 54 W. of Oban. It forms an oval uneven table-land, rising at its highest to 144 feet above the water, 1½ miles in circumference, and 71 acres in area. In the N. E., in the lee of the prevailing winds, is a tract of low shore, stretching out in beaches and forming a landing place; but elsewhere the coast is girt with cliffs from 84 to 112 feet high. Regarded in section, the rocks show themselves to be of three kinds — conglomerated tufa, forming the basement; columnar basalt, arranged in colonnades, which form the façades and the walls of the chief caves; and amorphous basalt, overlying the columnar basalt, but pierced here and there by the ends of columns and by angular blocks. The most remarkable feature of the island is Fingal's or the Great Cave, the entrance to which is formed by columnar ranges on each side, supporting a lofty arch. The entrance is 42 feet wide, and 66 feet high, and the length of the cave is 227 feet. The floor of this marvelous chamber is the sea, which throws up flashing and many-colored lights against the pendent columns, whitened with calcareous stalagmite, that form the roof, and against the pillared walls of the cave.

Staff College, a British military institution near Sandhurst, founded in 1858, for the instruction of officers desirous of being placed on the staff of the army. It is open to officers of all branches of the service who have served five years, but the number is limited to 40 students, selected by competitive examinations held annually in London about the month of June; and only one officer at a time from one battalion of infantry or regiment of cavalry, and only 10 officers from the two royal corps of artillery and engineers, can belong to the college. The course lasts two years (four terms), and the expenses, with the exception of mess subscriptions, are borne by the State. A candidate for admission must produce a certificate from his commanding officer that he is a good regimental officer and a report from the three senior officers of his regiment, a medical certificate of health, and a certificate that he has passed his troop or company examination.

Stafford, Wendell Phillips, an American jurist; born in Barre, Vt., May 1, 1861; received an academic education and was graduated at the Law Department of Boston University in 1883. He began to practise at St. Johnsbury, Vt., was president of the Bar Association of Vermont in 1898–1899; held a seat in the Vermont Legislature in 1892; and was a reporter of the decisions of the Vermont Supreme Court in 1896–1900. In the latter year he was made judge of the Supreme Court of that State. He was author of "Eurylochus Transformed" (1889); "Wendell Phillips"; etc.

Stag, or **Red Deer** (*Cervus elaphus*), a typical species of *Cervidæ* or deer, occurring in the N. of Europe and Asia. It was once

STAGS.

found throughout the whole of Great Britain, but is now confined to the Scotch Highlands. The horns or antlers are round and have a basal snag in front. The females are hornless and are named hinds. The horns of the first year are mere bony projections; they advance in development dur-

RED DEER: HIND AND CALF.

ing the second year, when the stag is named a brocket. In each succeeding year the horns grow more and more branched, the stag being named a hart in its sixth year, when the horns may be said to reach their maximum size. As in all deer, the horns are shed annually. The average height of a full-grown stag is about four feet at the

shoulders; the winter coat is greyish-brown; in summer, brown is the prevailing tint. The food of the stag consists of grasses and the young shoots of trees, lichens forming the greater part of its food in winter. The stag is a powerful runner and swimmer. Driven to bay, it becomes a formidable adversary to the largest and most powerful staghound, or even to man himself. The pairing season occurs in August, and the males then engage in combats for the females and become peculiarly fierce. The flesh is somewhat coarse.

Stag Beetle, in entomology, any individual of the family *Lucanidæ;* specifically *L. cervus,* one of the larger insects, the male

STAG BEETLE.

being about two inches long. Their projecting mandibles are denticulated, and somewhat resemble stag's horns; with these they can inflict a pretty severe wound. The stag beetle is common in forests, and flies about in the evening in summer. The larva feeds on the wood of the oak and the willow, into the trunks of which it eats its way, and lives for a considerable time before undergoing a metamorphosis. Some of the tropical stag beetles are very brilliantly colored.

Stage, in theaters and some other places of amusement, a platform elevated above the ground, and specifically applied to the raised floor on which performances are exhibited. In microscopy, the support on which the object is placed for examination. It is often quite plain, with single springs to keep the slide steady. It is often made circular, with graduated divisions and other fittings, which is a concentric stage. In high-class instruments there are generally screw motions giving two rectangular adjustments in the manner of the slide-rest of a lathe, to which the concentric fitting may or may not be added. This is called a mechanical stage, of which there are numerous modifications. The simplest stage generally has some fitting on its under side for receiving a spot lens, nicol prism, or other adjuncts.

Stage-Coach, a vehicle for carrying passengers on regular routes, the journey being accomplished by stages. Such vehicles were formerly universal in Great Britain and the United States, but the railway system has led to their almost entire discontinuance, except in localities to which the railway has not reached. The first "stages," so called, were wagons which carried goods and passengers toward the close of the 16th century. In 1610, Anderson, a native of Stralsund in Pomerania, secured the royal privilege of running stage coaches and wagons between Edinburgh and Leith. About 1640, stage coaches plied between the metropolis and the principal towns in the kingdom. The speed was slow on account of bad roads and the cumbrous nature of the vehicles. Eight days in summer and 10 in winter were occupied in traversing the road between London and Exeter, and even as late as 1754 it was considered quick traveling to reach Manchester from London (187 miles) in 4½ days, and Edinburgh in 10 days in summer and 12 in winter. The Edinburgh and London stage-coach of 1754 was the first to be mounted on steel springs. Seats were added on the roof for outside passengers about 1779. After 1784, stage coaches of improved construction were gradually introduced, and roadways were kept in better repair, so that a speed of 8 miles an hour was not uncommon. In France and Spain the stage-coach is known as the DILIGENCE (*q. v.*); and in Germany as the postwagon or postkutoche. The Russian tarantass serves the purpose of a stage-coach, but is a very different kind of vehicle.

Staggers, a popular term applied to several diseases of horses. Mad or sleepy staggers is inflammation of the brain, a rare but fatal complaint, marked by high fever, a staggering gait, violent convulsive struggling, usually terminating in stupor; it is treated by bleeding, full doses of physic, and cold applied to the head. Grass or stomach staggers is acute indigestion, usually occasioned by overloading the stomach and bowels with tough hard grass, vetches, or clover, a full meal of wheat, or other indigestible food. It is most common in summer and autumn, is indicated by impaired appetite, distended abdomen, dull aspect, unsteady gait, and is remedied by full doses of purgative medicine, such as six drachms of aloes and a drachm of calomel rubbed down together and given in a quart of thin well-boiled gruel. Frequent clysters, with hand rubbing and hot water to the belly, are likewise useful. Where the dullness increases, non-alcoholic stimulants should be given.

Staghound, the Scotch deerhound, called also the wolf dog, a breed that is rapidly dying out. These dogs hunt chiefly by sight and are used for stalking deer, for which

purpose a cross between the rough Scotch greyhound and colley or the foxhound is also often employed. True staghounds are wiry-

STAGHOUND, "ROSSIE RALPH."

coated, shaggy, generally yellowish-gray, but the most valuable are dark iron-gray, with white breast. They are of undaunted courage and great speed, and should stand not less than 28 inches high.

Stagirite, or **Stagyrite,** an appellation given to Aristotle, from the name of the place of his birth, Stagira, in Macedonia. The name of the town is Sta-gīr'a, and the appellation should be Sta-gī'rīte, but Brewer notes that Stăg'y-rīte is usually employed in English verse, and gives additional examples from Pope and Wordsworth.

Stagmaria, in botany, a genus of *Anacardiaceæ*. Leaves simple, without stipules. Calyx tubular, the limb irregularly ruptured, deciduous. Petals five, stamens five, styles one to three, ovary three-lobed. Berry kidney-shaped, one-seeded. *S. verniciflua*, a native of the Indian Archipelago, yields the hard black varnish called Japan lacquer.

Stahl, Friedrich Julius, a German author; born of Jewish parents in Munich, Germany, Jan. 16, 1802. He became a Protestant when 17, studied law at the universities of Central Germany, and in 1830 published the first volume of his greatest book, "The Philosophy of Law," the second volume of which appeared seven years later. In this work Stahl proclaimed the doctrine that belief in the revealed truths of the Christian religion is the only satisfactory basis of jurisprudence and politics. From 1832 to 1840 he taught alternately at Erlangen and Würzburg, and in 1840 was called to the chair of philosophy of law at Berlin. In the Prussian capital he acquired an influential position as a leader of the "Junker" or reactionary party in the Chamber of Magnates and as an uncompromising opponent of all political change, and the mouthpiece of a stern Lutheranism in the Church assemblies. He wrote several other books, as "On the Christian State" (1847), in which he advocated a sovereign despotism grounded on a doctrine very similar to the "divine right of kings"; "Protestantism as a Political Principle" (1853); "What is Revolution?" (1852); "Against Bunsen" (1856); and "Seventeen Parliamentary Speeches" (1862). He died in Brückenau, Bavaria, Aug. 10, 1861, a determined opponent to the last of the various liberal parties in both civil and ecclesiastical politics.

Stahl, Georg Ernst, a German chemist and physiologist; born in Anspach, Bavaria, Oct. 21, 1660. He was educated at Jena, where he took his doctor's degree in 1683; but, on the establishment of the University of Halle, in 1694, he was appointed Professor of Anatomy and Chemistry there. Acquiring great reputation in this office, he was, in 1716, invited to Berlin, and made counsellor of the court and physician to the king. Stahl was more eminent in chemistry than in medicine, because he was less fanciful. He made many important discoveries, the chief being his theory of phlogiston, which, though erroneous in itself, led to the discovery of great truths in chemistry. He composed a number of learned works in Latin on medical science and on chemistry. His phlogistic theory, which held its ground for nearly a century, was given in a work entitled "Fundamentals of Zymotics." He died in Berlin, May 14, 1734.

Stahl, P. J. (pseudonym of P. J. Hetzel), a French publisher and author; born in Chartres, France, Jan. 15, 1814. Of Alsatian origin, he studied law in Germany when a youth, basing on his experiences during this period his first literary successes: "The Life of a Student"; "The Story of a Snuffler"; and others. Among his popular works, most of which were published by himself, may be mentioned: "The Voyages and Discoveries of Mlle. Lili, and of her Cousin Lucien"; "The Devil at Paris"; "The Wit of Woman and the Woman of Wit." He died in Monte Carlo, March 17, 1886.

Stahr (stär), **Adolf Wilhelm Theodor,** a German author; born in Prenzlau, Prussia, Oct. 22, 1805. He was educated at Halle, and was for a number of years corector of the gymnasium at Oldenburg, but latterly resigned this post on account of ill health and settled in Berlin. His earlier works were connected with Aristotle and his philosophy, but latterly his literary activity extended over a wide field. His works include translations from Aristotle; books on art, travel, and literary and general history, as: "Torso"; "Art, Artists, and Art-Works of the Ancients"; "Lessing: His Life and Works"; "Goethe's Female Characters"; "The Prussian Revolution"; "Weimar and Jena"; "A Year in Italy"; "Paris Studies"; "A Winter in Rome";

"Pictures from Antiquity"; etc. He died in Weisbaden, Prussia, Oct. 3, 1878.

Stained Glass, glass painted on the surface with mineral pigments, which are afterward fused and fixed by the application of heat. See GLASS.

Stainer, Jakob, a German violin-maker; born in Absam, Tyrol, July 14, 1621, and was apprenticed to a maker of stringed musical instruments at Innsbruck. There is a legend, devoid of foundation, however, that he worked under some of the Amati at Cremona. He did somehow learn the secret of the Italian method of constructing violins, and so won a reputation that passed beyond Germany into Italy and England and lasted for more than a century. At the present day his violins are valued as curiosities, but are not esteemed of use by practical musicians. He died in 1683.

Stainer, Sir John, an English composer; born in London, June 6, 1840; was a chorister at St. Paul's from his 7th to his 16th year; appointed organist first at St. Michael's College, Tenbury, then in 1859 to Magdalen College, Oxford, and ultimately in 1872 to St. Paul's. While at Oxford he graduated both in arts and music. He was inspector of music to the Educational Department and the author of the oratorio "Gideon" (1875); the cantatas, "The Daughter of Jairus," "Mary Magdalene," "The Crucifixion"; a treatise on the "Theory of Harmony" (1871); "Music of the Bible" (1879); "Organ Playing"; etc.; joint author with W. A. Barrett of "Dictionary of Musical Terms," and editor of "Music Primers." He died April 1, 1901.

Staines, an interesting old English town, in Middlesex; on the left bank of the Thames; 6 miles S. E. of Windsor, and 18 S. W. of London. Its church of St. Mary, rebuilt in 1828, has a tower by Inigo Jones (1631), and the granite bridge of three arches, which here crosses the river, was designed by Rennie (1832), and cost $200,000. A stone (hence the town's name) bearing date 1285 here marks the limit of the Thames Conservancy. A Roman Catholic church in Gothic style was erected in 1868. There are mustard mills, breweries, and market gardens. Staines has a well-known race course.

Stairs, a succession of steps raised one above the other, affording means of communication between two points at different heights in a building, etc. Originally the stairs were placed from story to story in straight flights, like ladders, and were often external, being sheltered by a projection from the roof, but to save space the spiral form was adopted, the stair being contained in a cylindrical building projecting from the outside of the edifice. In this construction a central axis or newel reaching from the ground to the roof serves to support the inner ends of the steps, and the outer ends are let into the walls. The spiral form is still used in certain circumstances; but the finest stairs are now constructed in straight sections separated from each other by a wide step or platform called a landing. The separate division, open space, or apartment in which the stair is placed is called the staircase.

Stake Net, a form of net for catching salmon, consisting of a sheet of network stretched on stakes fixed into the ground, generally in rivers or friths where the sea ebbs and flows, with contrivances for entangling and catching the fish.

Stalactite and **Stalagmite,** formations of carbonate of lime. Stalactitic formations occur chiefly in long and more or less fantastic-shaped masses suspended from the roofs of caverns in limestone rocks. Stalactites appear to be continually forming; water containing carbonate of lime held in solution by carbonic acid, trickling through crevices in the roofs of the caverns, gradually during its exposure to the air loses its carbonic acid, and consequently deposits its carbonate of lime; the water passing over the portion first deposited gradually adds to it, and eventually gives the carbonate of lime its great length and stalactitic character. The flatter deposits, called stalagmites, are formed on the floor of the cavern by the water there depositing that portion of its carbonate of lime which is not separated during the formation of the stalactite. Stalactitic carbonate of lime is met with in the veins of lead ore in Durham and Northumberland, England. Caverns are sometimes nearly filled with these deposits, which in some cases are of very large dimensions. The most remarkable instances of their occurrence in Great Britain are in the cavern at Castleton in Derbyshire, and Macallaster Cave in the Isle of Skye. The grotto of Antiparos in the Archipelago, the Woodman's Cave in the Harz in Germany, that of Auxelle in France, and Luray (Virginia) and Mammoth (Kentucky) Caves in the United States are striking instances of their formation in other countries.

Besides the occurrence of this variety of carbonate of lime in the stalactitic form, it is sometimes met with reniform and tabular, and in other imitative shapes. The fracture is sometimes perfectly lamellar, occasionally fibrous, the fibers diverging from a center, with a pearly or silky luster, and sometimes resinous or waxy. The color varies from white to grayish, brown, red, and yellowish white. Opaque, but frequently translucent. The Oriental alabaster, much employed by the ancients in statuary and the formation of vases, appears to be of stalactitic origin.

Stalactite

Luray Cave.—To look at "Cave Hill" nobody would suppose that beneath its plain-looking exterior was a cave which is destined to become one of the most famous and widely known of all the underground phenomena of this world. In the waiting room visitors are equipped with light-giving apparatus, consisting of a combination of reflector and candlestick. Marshalled by a guide they descend through what looks like a cellar stairway. Down, down, and onward they go for hours, winding through miles of corridors down by the side of gaping chasms, then up, way up among the domes of grand halls, keeping close to the heels of the guide, who, whenever a striking feature of the cave is reached, proceeds to enhance the value of the sight by means of an illumination with magnesium tape. The Shenandoah Valley Railroad Company, who now own the cave, have liberally furnished it with stairways and plank walks. Rubber suits or extra wrappings are not required — there are no drippings from above. The temperature is pleasant, uniformly 60°, and the ventilation excellent. Neither is it necessary at any time to crawl or climb, but the journey throughout is safe, easy, and cleanly. During the presence of excursions or large parties the caverns are illuminated with electric light. The roof of the cave is said to average from 150 to 200 feet in thickness and to consist of an immense bed of limestone rock, through which the water soaks from the surface, each drop, impregnated with limestone, depositing its mite, thus beginning the formation of stalactites and stalagmites, which it takes centuries to bring to respectable proportions. The cave was accidentally discovered in 1879 in digging down through a sink hole. The only human relic found in the cave is an encrusted human skeleton lying in the bottom of a pit, which has been pronounced by professional men to be that a full grown man. The formations of the cave are so varied and profuse, presenting at every step, from the moment one enters till he reaches its remotest limit, new objects for admiration or wonder, that the mind becomes confused, overwhelmed, and unable to "take in" such a throng of objects rarely and sweetly beautiful or awfully grand and sublime. Indeed its endless variety — no two rooms presenting the same appearance, no two stalactites or stalagmites being alike — constitutes one of its principal charms and distinguishes it above all other known caves.

The crystal monuments and alabaster columns, high and vast; the crypts, cloisters, and cathedral-like apartments of this majestic under world; the glittering pendants and pearl-like formations on every hand; statues no bigger than a lady's finger, others like the "great giant Christopher." Here and there one will find quiet pools and peaceful lakes, which the winds of heaven have never kissed, and millions of the most curious and beautiful forms which the fantastic brain of fairies could conceive; pouting, trickling rills and flowers, and pieces of drapery to carved and fluted columns; groups of statuary and arched domes of imposing dimensions, make one feel as if he were in the enchanted abode of the subterranean gods. Here millions of pendent stalactites, like tapering pencils, bristle from the arching dome overhead, while stalagmites are grouped about like statuary on every hand. One is lost in admiration and wonder over massive columns carved and fluted, great forests of leafless trees, grand cathedrals with lofty spires, forts and castles in picturesque ruins, foaming cascades that seem to have been stilled forever by a breath of everlasting frost, richly carved pillars and pedestals, immense organs whose pipes are actually attuned to some extent in perfect harmony with the laws of musical sound, folds of lovely drapery ornamented with tracery like fine lacework and hung with the edgings of heavy silver bullion, solemn looking cemeteries with grim wildernesses of tombstones and monuments and shafts in sad disorder, and a thousand other designs which curious nature, in this her playground, fashioned during the centuries that were untold ages old when Egypt's race was in its youth. Some of the figures seem to be cut from the clearest crystal, while others run through the various grades of crystalline translucency into grades that are opaque, and in colors from a white that rivals the driven snow through all the tints between that and dull black.

In the grand entrance is the great amphitheater, 20 feet high and 80 feet wide. Just beyond and in the center stand Washington's Pillar, measuring 14 by 30 feet; Vegetable Garden, containing odd-shaped stalagmites resembling vegetable forms according to one's fancy. Visitors cross Muddy Lake on a bridge; to the left is the gallery of the theater. Passing the Natural Bridge they enter the Fish Market, where hang the fish in a row; the semblance is perfect; one recognizes their bluish backs, whitish bellies and forked tails, while to increase the illusion the trickling water gives them the moist, glossy coating of a catch fresh from the sea. Ascending the grand stairway one comes to Elfin Ramble, 500 feet in length by 300 in breadth and 15 feet in height. Here the visitor gazes into the dreadful darkness of Pluto's Chasm, 75 feet deep, 50 feet wide and 500 feet in length. In the distance rises the Specter Column, 40 feet high and 5 in diameter; and still further on is Prosperient Pillar. Entering the Throne Room,

Stalactite

near by is Mirror Lake. Descending one beholds Hagar gazing pensively at her famished child, Ishmael. There hang in exquisite color and texture 16 alabaster scarfs side by side. The visitor then moves on to five small lakes or springs — Cannon Ball, Imperial, Casket, Cauliflower, and Crystal. Their crystal bottoms sparkle beautifully in the light of our lamps. Imperial Spring is 16 feet deep, in a grotto 35 feet long and 25 feet wide.

Crossing the Gulf of Despair, clambering over stalagmite stumps, one inspects the Grotto of Oberon and descends to Skeleton Gulch. There, embedded in these rocks and mud, were the bones of a human being. Here, in this dark and dismal room, with no "eye to pity and no arm to save," perished some lone traveler. The visitor next passes beneath a low, broad arch, a piece of drapery, a shawl formed of beautiful, translucent stone, hanging in graceful folds, and enters Giants' Hall, where the wonders are labeled with all kinds of mythological, historical and fancy names. Here is Titania's Veil, a pure white fabric of lace-like texture; the Snow Bank, a broad, white stream of stone; the Frozen Fountain of rigid beauty. Near by is Diana's Bath; then the Saracens' Tent, a large circular space inclosed by long yellow draperies descending from the ceiling some 40 feet above the observer's head. As he enters the great Cathedral, a fallen column seems to bar his way; it is 20 feet long, 14 feet in diameter, and about 170 tons in weight. How did it fall, and when? What convulsion of nature overturned it? Geologists and scientists seem powerless to give exact information. Moving on beneath the fallen monster, the visitor passes the snow-white Angel's Wing, spread in spiritual beauty, and in its loveliness unequaled even by Titania's Veil. The wonder of the Cathedral is the organ, a mass of drip stone with long sonorous stalactites, graduated in size like the pipes of an organ, and producing, when struck with knuckles or a piece of wood, real musical sounds. Chapman's Lake, the Tower of Babel and Katie's Secret, are passed, and the visitor descends into Giant's Hall proper. Everything before him is of gigantic proportions — the Chimes — the Empress Column rising 40 feet from its base, clothed with beauty and perfectly white at its summit; the Sultan Column — the Indian Squaw — Chalcedony Cascade and Hanging Rock.

The Amphitheater or Ball Room is large and spacious, with roof 100 feet above the floor. On illumination days, lads and lassies frequently assemble here for a dance. The music of the brass band has a strange sound here and inspires a feeling of awe. Here are shown the Tombs of the Martyrs, the Vault of the Lady's Riding Whip, as perfect as if chiseled by the hand of Phidias. In a separate apartment is Cascade Spring, Collins' Grotto, Snowball Spring, and the Devil's Pot. On returning one passes the Bird's Nest — a cavity in the rocks containing three beautiful white eggs, — cave pearls — from which the parent birds have taken wing. Following a dark ravine and mounting two large flights of steps, Campbell's Hall is entered, 35 feet high and 150 feet in diameter. Here is the Fountain of Tears and Scale Column, or Mermaid. Next are passed a series of rooms containing Comet Column, the Wet Blanket, the Hollow Column, through the axis of which runs a streamlet of fresh water, and the Bridal Chamber, which has been consecrated by an actual marriage. As one passes Brand's Cascade and Ladies' Toilet, he is shown moccasin prints, and the remains of hart, deer, wolves, bears, and the tracks of rabbits, raccoons, and rats.

There are passed in turn the Pyramid of Cakes, the Chinese Idol, Tartarus, Blacksmith's shop, the Cannon Ball, the Grape Spring, the Leaning Towers, Jacob's Well, and Bayonet Well. Stonewall Avenue leading off to the left from the main entrance contains Stonewall's tent, Paradise Room, the Three Brothers or Twin Lakes, the Canopy, the Irish Potatoes, the Throne Room, Hades and Lake Lethe, the largest body of water in the cave. Beyond is Erebus, shaped like the figure eight. The visitor then emerges into Crystal Room, and as he returns is tempted to pluck from the flower garden a memento. Imagine buds, vines, tendrils, fuchsias, cactus leaves and a nameless variety of exquisite flowers and the reader may form some conception of the varied wonders of this subterranean garden. With reluctant step one moves on. Large areas, embracing some of the finest parts of the cave, are not yet open to the public. There remains for the undaunted explorer regions for which special preparation is necessary. It is impossible to adequately describe the wonders of these caverns — they must be seen to be appreciated. The whole is a mass of gorgeous splendor, with probably no equal in America if in the world.

Mammoth Cave.—The entrance to the cave is not very striking. It looks as if it were only a hole into which rubbish had been tumbled down. The visitor has to wander over the many miles of this troglodyte world, and to inspect its variety of wonders, in order to comprehend its full interest and importance. On first entering, he finds himself walking along a subterranean avenue. If he examines the ground a well-marked rut, made by wheels, is distinctly visible. The explanation of this is that SALTPETER (*q. v.*) used to be made in the cave, and bullock carts were wont to pass out and in with the

materials. After the peace with England, in 1814, it was no longer possible to make saltpeter in the cave, on account of the East Indian article coming into the market at cheaper rates. The vats, pipes, and other remains of the saltpeter works are still visible, not having been exposed to the weather. These old saltpeter works are all within about half a mile of the entrance. At this place the cave opens out to a wide circular space, which is known as the "Rotunda"; and near this is a spot called the "Methodist Chapel," where a negro congregation used in days gone by to meet. A projecting rock served as a pulpit, and some of the logs forming the seats still remain. A black congregation in a chapel deep underground, and lighted, no doubt, but scantily, with flickering lamps, must have had a weird look about it. After this come the Gothic Gallery, the Kentucky River Cliffs, the Giant's Coffin, the Star Chamber, and other recesses. Just behind the Giant's Coffin is a narrow passage where the great thoroughfare is left. The next important points which are visited are the Bottomless Pit and Gorin's Dome"; further on still is Fat-Man's Misery, so named from a narrow passage which is trying to those who are fully developed in corporeal breadth. Tall-Man's Misery is where the rocky roof is so close to the ground that visitors have to crawl in a bent position on all fours to get through, while the short and stout individuals have in their turn the advantage at this place. The Gothic Chapel, The Mammoth Dome, Dead Sea, River Styx, and a number of other places with characteristic and expressive names, are included in what is called the Short Route.

On the other side of the River Styx the Long Route may be said to begin, and it extends to more than double the distance of the short one. The different points of interest in it are known by names which in some instances refer to individuals, and in others are expressive of features of the place or of what it suggests. One finds here, Ole Bull's Concert-Room and Silliman's Avenue; the Pass of El Ghor is noted as one of the most picturesque points in the cave; The Black Hole of Calcutta is also suggestive. The Maelstrom is a pit of profound depth, which only one or two bold spirits have had the courage to explore. To do so, one has to dangle at the end of a rope while descending, a large portion of the way among falling waters, to a depth of nearly 200 feet below.

The stalactites of this cave form one of its many features of interest. Many parts of the cave are covered with growths of that kind, as if they were flowers in stone. The Gothic Chapel owes one of its attractions to this; but there are other places, such as the Grape Clusters, Martha's Vineyard, and the Holy Sepulcher. The stalactites at this last-mentioned place assume the appearance of a charnel house. The name was given by a Roman Catholic priest, who was so struck by it that the name came from his lips as he first gazed on the spot, and has been retained as expressive of its character. Some are disappointed in seeing comparatively few stalactites in the cave, and in their lack of brilliancy. They are not to be found in quantities overhead like tasseled fringe in any part, but are seen here and there, as the water has trickled slowly through from above — the lime giving form, and the iron a dark rusty color. The process of hardening requires years, some say ages, before they reach the brilliancy of alabaster. The stalagmite, or lower part, gradually rises by accretion from the drops and meets its stalactite from above, till they unite in one column; and it is wonderful, in one case at least, to see a huge chair, as it were, thus formed, reaching from floor to ceiling, with its head-rest, its arms, and its comfortable seat, except that the latter is a little too high. In another place, similar Herculean columns form a Gothic arch, which has several times been used for the hymeneal altar. Like the craggy walls in the White Mountains, the avenues of the cave seem to present many gigantic silhouettes cut in the limestone, such as George Washington, Barnum's fat girl, and the heads of various animals, like the monkey and the wild cat. One of the most remarkble exhibitions of this class is a gigantic milky-white statue of Martha Washington. The guide goes ahead, and the apparent figure is simply the opening between the dark walls at a turn in the avenue illuminated by the lights. This hallucination was discovered accidentallly, as a party going out first saw the light of a party coming in.

Stalker, James, a Scotch clergyman; born in Crieff, Scotland, Feb. 21, 1848; was educated at Edinburgh University. His theological studies were carried on at the New College, Edinburgh, and at Berlin and Halle. In 1874 he was ordained minister of St. Brycedale Free Church, Kirkcaldy, and after a very successful pastorate was translated to Free St. Matthew's, Glasgow, in 1887. Dr. Stalker was one of the most popular religious writers of the day. His works are: "The New Song," "Life of Christ," "Life of St. Paul," "Imago Christi," "The Preacher and His Models" (being the Yale lectures on preaching), "The Four Men," "The Trial and Death of Jesus Christ," "The Two St. Johns," "The Christology of Jesus"; etc.

Stalkeyed Crustacea, in zoölogy, applied to certain crustacea named *Podophthalmata,* which have the eyes set at the

end of footstalks of variable length. The lobster, shrimp, and crab are examples of this group.

Stall, a fixed seat in English churches or cathedrals, wholly or partially enclosed at the back, with elbows at the sides, and usually a ledge for books, and a kneeling board in front. Stalls are generally of wood, occasionally of stone, enriched with sculptured foliage and figures, sometimes of a grotesque character; and in many cases each stall is covered with a rich canopy of tabernacle work; when there are two rows of stalls on each side, those in the hinder row only have canopies. In cathedrals and collegiate churches, the stalls are used by the canons and prebends. Sometimes there is a row of stalls for the choir, who occupy them because in some sort they fulfill part of the duties of the monks — the chanting of the divine office. Also in England, a high-class seat in a theater, between the pit (where it exists) and the orchestra.

Stall, Sylvanus, an American clergyman; born in Elizaville, N. Y., Oct. 18, 1847; was graduated at Pennsylvania College, Gettysburg, Pa., in 1872; studied theology there in Union Theological Seminary; was ordained in the Lutheran Church; and held various pastorates. In 1890 he became associate editor of the "Lutheran Observer." His publications include "How to Pay Church Debts" (1880); "Talks to the King's Children" (1893); "What a Young Boy Ought to Know"; (1897); "What a Young Man Ought to Know" (1897); "What a Young Husband Ought to Know" (1899); "What a Man of Forty-five Ought to Know"; (1901); etc. He also edited and published "Stall's Lutheran Year Book" (1884–1888), and in 1886 received a prize from the Lutheran Publication Society for the best table of contents for the "Lutheran Encyclopædia."

Stallbaum, Johann Gottfried, a German philologist; born in Zaasch, Prussian Saxony, Sept. 25, 1793; entered the Thomasschule in 1808, and in 1815 the University of Leipsic, whither after two years of teaching at Halle (1818–1820), he returned to be an under-master in his old school. He became its rector (1835), and in 1840 was appointed extraordinary professor, retaining both offices down to his death, Jan. 24, 1861. Stallbaum did good service to classical philology by his critical edition of Plato's Works (12 vols. 1821–1825), a separate edition of his text (8 vols. 1825), and an edition with a commentary in the "Bibliotheca Græca" (9 vols. 1827; new ed. 1867). Besides other editions of the classics he published "Ueber den innern Zusammenhang musikalischer Bildunger Tugend mit dem Gesammtzwecke des Gymnasiums" (1842), "Das Gricchische und Lateinische in unseren Gymnasien" (1846), etc.

Stalybridge, a cotton town of Cheshire and Lancashire, England, occupying a hilly site on both banks of the Tame; 7½ miles E. by N. of Manchester. Dating only from 1776, it has huge factories for the spinning of cotton yarns and calico-weaving, iron foundries, and machine shops, a town hall (1831), market buildings (1867), a mechanics' institute (1861), an Odd Fellows' hall (1878), and, between it and Ashton-under-Lyne to the W., the Stamford Park (1873). Pop. (1901) 27,673.

Stamen, in botany, the male organ of a flower, called by the old botanists an apex and a chive. Morphologically it is a transformed leaf. It consists of a filament, an anther, and pollen. The last two are essential, the first is not. When anther and pollen are wanting, the stamen is called a sterile or abortive. If the stamens are equal in number to the petals, then normally they alternate with them. When opposite, as in the primrose, it is supposed that the stamens are the second of two rows of which the first has not been developed. When the stamens are twice as numerous as the petals, and are arranged in a circle, as in Silene, it is believed that they really constitute two rows of five each, though they look like a single row. They always originate from the space between the base of the petals and the base of the ovary, but they may cohere with other organs, whence the terms epigynous, hypogynous, and perigynous. Cohesion among themselves may make them monadelphous, diadelphous, or polyadelphous. They may be on different flowers, or even different plants, from the pistils, whence the terms monœcious or diœcious. Other terms used of stamens are exserted, included, declinate, didynamous, and tetradynamous. In the Linnæan or artificial system of arrangement most of the classes are framed on the number of stamens. The stamens taken collectively form the andrœceum or male apparatus of the flower.

Stamford, a city in Fairfield co., Conn.; on Long Island Sound, and on the New York, New Haven, and Hartford railroads; 34 miles E. of New York. Here are the Ferguson Library, high school, hospital, town hall, waterworks, street railroad and electric light plants, several National and savings banks, and a number of daily and weekly newspapers. The industries include woolen mills, lumber mills, and manufactories of carriages, chemicals, patent medicines, hardware, stoves, straw hats, machinery, shoes, locks, dyestuffs, pottery, etc. The assessed property valuation is about $18,000,000. Pop. (1910) 25,138.

Stamford, a municipal borough of England, chiefly in Lincolnshire, but partly also in Northamptonshire; on the Welland, 12 miles W. N. W. of Peterborough. Hengist is said to have here defeated the Picts and Scots in 449, and Stamford thereafter is notable as one of the Danish "five burghs," as having been visited by at least 13 sovereigns (from Edward the Elder in 922 to Queen Victoria in 1844), for the persecution of its Jews (1190), as having between 1266 and 1334 only missed becoming a rival to Oxford, for its colony of Flemish Protestants (1572), as the birthplace of the earliest provincial newspaper, the Stamford "Mercury" (1695), and for its famous bull-running on Nov. 13, from King John's time till 1839. It has lost 10 of its 16 churches, an Eleanor Cross, two castles, six religious houses, and two hospitals. Existing edifices are St. Mary's, with a fine spire, All Saints, with a fine tower and steeple, St. Martin's with Lord Burghley's grave and, in the church-yard, Daniel Lambert's, a town hall (1777), corn exchange (1859), literary institute (1842), a bridge (1849), Browne's Hospital (15th century), and boys' and girls' high schools (1874–1876). "Burghley House, by Stamford town," is a magnificent Renaissance pile, dating from 1575, with a noble park, carvings by Grinling Gibbons, and a great collection of pictures. The trade and industries are mainly agricultural. For good services rendered by the inhabitants at the battle of Loose-coat-field (in 1469) the town seal bears the royal arms.

Stammering, or **Stuttering,** an infirmity of speech, the result of failure in coördinate action of certain muscles and their appropriate nerves. It is analogous to some kinds of lameness; to cramp or spasm, or partial paralysis of the arms, wrists, hands, and fingers, occasionally suffered by violinists, pianists, and swordsmen; to the scrivener's palsy, or writer's cramp, of men who write much. For speech — like writing, fencing, fingering a musical instrument, and walking — is a muscular act involving the coördinate action of many nerves and muscles.

The words stammering and stuttering practically denote the same infirmity. Any distinction that may have come to be established in the usage of them respectively would seem to be that stuttering — an onomatopœic word — is now limited more or less to the futile repetition of sounds, while stammering (akin to "stamp," "stump," "step," "stop") covers the whole defect, the hesitation, glide, stop, holding on to the sound as well as repeating it. With defective articulation due to malformation — cleft palate, high-roofed mouth, disproportionate tongue and tonsils; or due to affectation and bad habit — interjection of meaningless sounds, lisping, burring, and other such imperfections of speech, we have nothing further to do in this article beyond remarking that a fault of habit may be entirely cured, a faulty formation can only be mended, its irksomeness alleviated.

Since speech at a high degree of excellence is a fruit of advanced civilization, it is not startling to be told that stammering does not prevail among Negroes in Africa and North American Indians. But when it is proved to be pretty wide-spread in Prussia, Great Britain and its colonies, and the United States and uncommon in Italy and Spain, the question suggests itself whether languages of Teutonic origin are not more apt to generate stammering than languages of Latin origin. A much larger proportion of males stammer than females.

Stammering, the chief of the imperfections of speech, may be hereditary, and it may be acquired by imitation. Like yawning, it is infectious. It may be the abiding result of mental strain or shock. Fever may bring it on, epilepsy, hysteria, and nervous affection, temporary failure of health, any excitement, soreness of the mouth. It rarely shows itself earlier than at four or five years of age. It usually begins in youth, but may be produced at any later age. It used to be ascribed exclusively to the organ of articulation, the mouth; to faulty setting of the teeth or the jaws, to the largeness and thickness of the tongue, its weakness of movement, its excessive vigor. The cause indicates the cure. A wedge was cut out of the tongue, lengthways, to make a path for the current of air. The root of the tongue was cut to break its excessive vigor. The tongue was thought to lie too flat on the bottom of the mouth; a plug was inserted to raise it, Demosthenes and the pebbles being referred to. It was one of the secret cures to tell the stammerer to keep the tip of his tongue on the roof of his mouth. An improvement on this was to keep the whole breadth of the tongue lying on the palate. When, by-and-by, the breathing began to be taken into account, stammering was explained exclusively by reference to the organ of respiration, and the cure was breathing exercises which were kept secret. The latest step in the research for the cause and cure of stammering has been to take full account of the vocal chords or cushions and the vocal chink.

Stammering occurs in the mouth, the organ of articulation. Its proximate cause is always in the larynx, the organ of voice. Sometimes the lungs, the organ of breathing complicate the uncertainty and unsteadiness of the vocal chords and the vocal chink in the larynx. A current of air, variously shaped by the mouth as a whole, is what we call a vowel. A stammer on a

vowel can only take place in the vocal chink, *rima glottidis*. The sounds called consonants are produced by closures, more or less firm, of contents of the mouth. Thus, *b*, *p*, *m*, *w*, by the closure of the two lips; *f*, *v*, of the lower lip and upper teeth; *g* soft and *sh*, of the teeth; *l* and *th*, tongue and upper teeth; *t*, *d*, *n*, *s*, *z*, *y*, tip of the tongue and fore gum; *g* hard and *k*, back edges of the tongue and back gum. Stammering may occur at any of these six closures. It is, perhaps, most apt to occur at the labials *b*, *p*, the dentals *d*, *t*, the gutturals *g* hard, *k*, because for these the closure is firmest. The stammerer has no difficulty in setting lips, teeth, tongue, and gums against each other as required. His difficulty is to relieve the closure, to get at the vowel which is to follow the consonant. The tongue, for example, will not part with the teeth—seems to cling spasmodically to them. Why? Because the current of air, the vowel, does not come at the proper instant through the vocal chink to relieve it. In this way the three observable modes of stammering are explained. If the vocal chink does not open soon enough there is a stop stammer; if it flutters, there is a stutter; if it opens too soon, there is a glide stammer. But, further, the lungs expand and contract by nervous and muscular energy; and, besides, the muscular and nervous machinery of the breastbone, ribs, midriff, and upper abdomen are all concerned in that expansion and contraction. These complicated and delicate bellows which supply air under pressure to the organ of voice may be defective, out of order, misused. Their working is to be closely observed in the case of each stammerer. Stammerers, as a rule, breathe badly. They constantly try to speak when their lungs are empty.

Stammering can be cured. It often disappears gradually without effort at cure. Improvement generally takes place as age advances. In some cases resolute endeavor is demanded. A waving motion of the arms, time kept to a baton, were favored as cures at one time. They were on the lines of the musical methods of cure—intoning, chanting, singing—which were based on the fact that most stammerers can sing. The doctrine of this article suggests as instructions for cure: Regulate the breath. Work for a habitual use of the chest voice—*i. e.* for deeper, steadier vibration of the vocal chords—because people generally stammer in a head voice. Take exercise, in a chest voice, on the sounds (seldom vowels) at which a stumble is apt to be made.

Stamp, a term specifically applied to the public mark or seal made by a government or its officers upon paper or parchment whereon private deeds or other legal agreements are written, and for which certain charges are made for purposes of revenue. The name is also applied to a small piece of stamped paper issued by government, to be attached to a paper, letter, or document liable to duty. See STAMP DUTY.

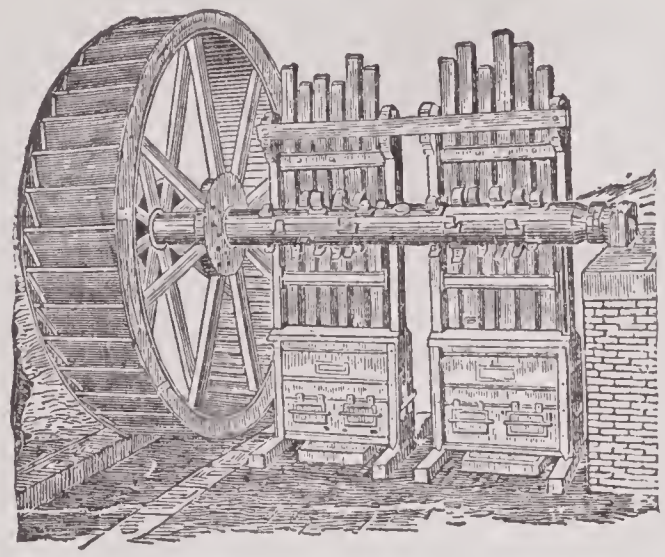
Stamp Act, an act for regulating the stamp duties to be imposed on various documents, specifically an act passed by the British Parliament in 1765, imposing a stamp duty on all paper, parchment, and vellum used in the American colonies, and declaring all writings on unstamped paper, etc., to be null and void. The indignation roused by this act was one of the causes of the Revolutionary War.

Stamp Duty, a tax or duty imposed on pieces of parchment or paper, on which many species of legal instruments are written. In Great Britain stamp duties on legal instruments used to be chiefly secured by prohibiting the reception of them in evidence unless they bore the stamp required by the law. By the Customs and Inland Revenue Act (1888), however, the not stamping of bonds, conveyances, leases, mortgages, or settlements, is held to be an offense punishable by a fine of $50. The internal revenue acts of the United States of 1862, and subsequent years, required stamps for a great variety of subjects, under severe penalties in the way of fines and invalidating of written instruments; stamps for liquors and tobacco are still in use.

Stamping of Metals. Many articles are shaped from sheet metal by means of steel dies brought together in a stamping press. The stamping machines assume various forms, and are worked manually, by steam, or by hydraulic power. The ordinary stamp used for brass foundry consists of an iron hammer or "ram" working between two upright pillars or guides. An intaglio die is fixed to the bed of the machine, and a raised counterpart or reverse die to the hammer. A "blank" or piece of sheet metal is laid on the lower die, and the hammer, elevated by a rope or other means, is allowed to descend, with the result of sinking the sheet metal into the die beneath. Several successive blows are given, and between them the metal is annealed in order to restore its ductility. Balance weights of chandeliers and other globular articles are stamped in pieces which are afterward soldered together. Vessels of tinned iron are produced by pressing the sheet metal into as many as 16 to 25 molds in succession, each mold approaching more and more to the form of the finished article. Annealing is performed after each pressing, and the vessel is finished by tinning and burnishing. Objects in German silver are stamped in like manner.

Stamp Mill, a contrivance of great utility in reducing hard mineral ores to a pul-

verized condition. It consists of an engine containing a series of heavy iron shod pestles moved by water or steam power. The



STAMP MILL.

one shown in the illustration is worked by an undershot wheel and has two batteries of six stamps each.

Stanchio. See Cos.

Standard, a flag or ensign round which men rally, or under which they unite for a common purpose; a flag or carved symbolical figure, etc., erected on a long pole or staff, serving as a rallying point or the like. The ancient military standard consisted of a symbol carried on a pole like the Roman eagle, which may be considered as their national standard. Each cohort had its own standard by which it was known, and which was surmounted with a figure of Victory, an open hand, etc., the pole being decorated with circular medallions, crescents, etc. The labarum was the peculiar standard adopted by Constantine. In mediæval times the standard was not square, like the banner, but elongated, like the guidon and pennon, but much larger, becoming narrow and rounded at the end, which was slit, unless the standard belonged to a prince of the blood-royal. The size of the standard was regulated by the rank of the person whose arms it bore: that of an emperor was 11 yards long; of a king, 9 yards; of a prince, 7 yards; a marquis, 6½ yards; an earl, 6 yards; a viscount or baron, 5 yards; a knight-bannerct, 4½ yards; and a baronet, 4 yards. It was generally divided into three portions — one containing the arms of the knight, then came his cognizance or badge, and then his crest; these being divided by bands, on which was inscribed his war cry or motto, the whole being fringed with his livery or family colors. Cavalry standards are properly banners of a small size. The corresponding flags used by infantry regiments are called colors.

Also that which is capable of satisfying certain defined conditions fixed by the proper authorities; especially that which is established by the competent authority as a rule or measure of quantity; the original weight or measure sanctioned by government, and deposited in some public place, to be used in regulating, adjusting, and trying weights and measures used in traffic.

In botany, the erect and expanded fifth or upper petal in a papilionaceous corolla. Called also vexillum. In coinage, the proportion of weight of fine metal and alloy established by authority. Standard gold is a mixture of metal containing 11 parts of pure gold, with one part of alloy — *i. e.*, 22 carats fine, with two carats of alloy. Standard silver is a mixed metal, containing 37 parts of pure silver, with three parts of alloy. In horticulture, a tree or shrub standing by itself, without being attached to any wall or support; also, a shrub, as a rose, grafted on an upright stem. In machinery, a vertical principal post of a machine frame. In old armor, a collar of mail, worn in the 15th century, for the protection of the neck of an armed soldier. In ship-building, a knee timber above deck, having one erect and one prone arm, bolted to the bitt, or other object, and to the deck and its beams. In vehicles, an upright rising from the end of the bolster to hold the wagon body laterally.

Standard, Battle of the, a battle in which David I. of Scotland, who had espoused the cause of Maud against Stephen, was signally defeated by the English under the Bishop of Durham. It was fought in the neighborhood of Northallerton, in Yorkshire, on Aug. 22, 1138, and it received its name from the fact that the English forces were gathered round a tall cross mounted on a car, and surrounded by the banners of St. Cuthbert, St. Wilfred, and St. John of Beverley.

Standard Time, a system of time-reckoning, chiefly for the convenience of railroads in the United States, established by mutual agreement in 1883, on principles first suggested by Charles F. Dowd, of Saratoga Springs, N. Y. The United States, beginning at its extreme E. limit and extending to the Pacific coast, is divided into four time-sections: E., central, mountain, and Pacific. The E. section, the time of which is that of the 75th meridian, lies between the Atlantic Ocean and an irregular line drawn from Detroit, Mich., to Charleston, S. C. The central, the time of which is that of the 90th meridian, includes all between the last-named line and an irregular line from Bismarck, N. D., to the mouth of the Rio Grande. The mountain, the time of which is that of the 105th meridian, includes all between the last-named line and the W. boundary of Montana, Idaho, Utah, and Arizona. The Pacific, the time of which is that of the

120th meridian, includes all between the last-named line and the Pacific coast. The difference in time between adjoining sections is one hour. Thus, when it is 12 o'clock noon in New York city (E. time) it is 11 o'clock A. M. (central time) at Chicago, and 10 o'clock A. M. at Denver (mountain time), and at San Francisco, 9 o'clock A. M. (Pacific time). The true local time of any place is slower or faster than the standard time as the place is E. or W. of the time meridian; thus, the true local time at Boston, Mass., is 16 minutes faster than E. standard time, while at Buffalo, N. Y., it is 16 minutes slower, the 75th time meridian being half way between Boston and Buffalo. Local time and standard time agree at Denver, Col., as Denver is on the 105th meridian, that of the mountain section. See UNIVERSAL TIME.

STANDING STONES, LUNDIN LINKS, FIFESHIRE.

Standing Stones, rude unhewn blocks of stone in an upright position in almost every part of the world, in Europe, India, Persia, and even in Mexico. Whatever may have been the period of their erection, their great size would necessitate the knowledge of the use of mechanical power. They are found more frequently in Great Britain, and were supposed to belong to the time of the Druids; but modern investigations have deprived this theory of its certainty. There can be no doubt, however, that these monoliths mark the scene of some remarkable event, as the death of a hero, or a battle, which latter theory is confirmed by the finding of human skeletons and weapons of war. Another use may have been as landmarks, and for a third, reference is made to them in the Old Testament as "pillars," by which kings were anointed. The stone forming part of the coronation chair of English sovereigns is one of these monoliths. They are found singly and in groups, of the latter of which the most remarkable are Stennis in Orkney, Stonehenge and Avebury in Wiltshire, and Carnac in France. See STONEHENGE.

Standish, Myles, an American soldier; born in Duxbury, Lancashire, about 1584; served in the Netherlands; and, though not a member of the Leyden congregation, sailed with the "Mayflower" colony to Massachusetts in 1620, and became the champion of the Pilgrims against the Indians. During the first winter his wife died, and the traditional account of his first effort to secure another partner has been made familiar by Longfellow. In 1622, warned of a plot to exterminate the English, he enticed three of the Indian leaders into a room at Weymouth, where his party, after a desperate fight, killed them, and a battle that followed ended in the flight of the natives. Standish was the military head of the colony, and long its treasurer. A monument, 100 feet high and surmounted by a statue, has been erected to him on Captain's Hill at Duxbury. In 1632 he settled at Duxbury, Mass., where he died, Oct. 3, 1656.

Stand-Pipe, a boiler supply pipe of sufficient elevation to enable the water to flow into the boiler notwithstanding the pressure of the steam. Stand pipes are also used on the eduction pipes of steam pumps to absorb the concussions arising from pulsations and irregularities, caused by the unavoidable employment of bends and change in the direction of pipes. Stand pipes for this purpose are erected on the eduction pipe, as near the pump as possible. In hydraulic engineering, a stand pipe is a curved vertical pipe, arranged as a part of the main in waterworks to give the neces-

sary head to supply elevated points in the district, or to equalize the force against which the engine has to act.

Stanfield, Clarkson, an English painter; born in Sunderland, England, in 1794. He became a sailor, and in the China seas he served for a time in the same ship with Douglas Jerrold. He showed talent both in painting and drawing, and was taken note of by Captain Marryat. Stanfield left the navy in consequence of an injury to his feet, caused by a fall from the mast head, and about 1818 took to scene-painting as a means of earning his bread — at first in the Old Royalty Theater, and afterward in Edinburgh and at Drury Lane. The first picture by him that attracted any considerable notice was "Market Boats on the Scheldt," exhibited at the British Institution in 1826. In 1830 Stanfield exhibited at the Academy his "Mount St. Michael, Cornwall," which placed him at once in the foremost rank as a marine painter. In 1823 Stanfield, in conjunction with David Roberts and others, founded the Society of British Artists. Elected A. R. A. in 1832 and R. A. in 1835, he continued to send pictures to the Academy till his death. Among his best-known pictures, marked by truth, finish, and poetic feeling, were "The Abandoned" and "The Wreck of a Dutch East Indiaman." He died in Hampstead, May 18, 1867.

Stanford, Charles Villiers, an English composer; born in Dublin, Ireland, Sept. 30, 1852. He entered at Queen's College, Cambridge, and in 1873 was appointed organist at Trinity College there. Except his operas, most of his works have been produced at one or other of the musical festivals in the provincial capitals of England — Gloucester, Birmingham, Leeds, Norwich, etc. His best and most successful productions have been the choral settings of Tennyson's "Revenge" (1886); "The Voyage of Maeldune" (1889); and Browning's "Cavalier Ballads"; the oratorios "The Three Holy Children" (1885) and "Eden" (1891); the operas "The Veiled Prophet of Khorassan" (1881); "Savonarola" (1884); and "The Canterbury Pilgrims" (1884); an orchestral serenade; a couple of symphonies, particularly the Elegiac symphony (1882); and some pieces for the violin and pianoforte. In 1882 he was appointed Professor of Composition and Orchestral Playing in the Royal College of Music, and in 1887 succeeded Sir G. A. Macfarren as Professor of Music in the University of Cambridge. Knighted 1902.

Stanford, Jane Lathrop, an American philanthropist; born in Albany, N. Y., Aug. 25, 1825; was the wife of Leland Stanford, the founder of the Leland Stanford Jr. University. She built and endowed the Children's Hospital in Albany, N. Y., at a cost of $200,000; gave $160,000 to the kindergartens in San Francisco, Cal., and after the death of her husband in 1893 devoted herself to the development and support of the Leland Stanford University. In 1901 she supplemented her gifts to the university by turning over to its trustees stocks valued at $18,000,000; her residence in San Francisco, valued at $400,000, for a museum and art gallery; and land worth $12,000,000. These gifts swelled the endowment of the university to more than $45,000,000, making it the most richly endowed educational institution in the world. She died Feb. 28, 1905.

Stanford, Leland, an American philanthropist; born in Watervliet, Albany co., N. Y., March 9, 1824; studied law; was admitted to the bar in 1849, and the same year began to practise at Port Washington, Wis. In 1852 he went to California, where he engaged in mining, but in 1856 removed to San Francisco and there engaged in business, laying the foundation of a fortune estimated at more than $50,000,000. In 1860 he made his entrance into public life as a delegate to the Chicago convention that nominated Abraham Lincoln for the presidency. Subsequently he was elected president of the Central Pacific railroad in 1861; was governor of California in 1861–1863; and in 1885 was elected to the United States Senate. In memory of a deceased son, Leland Stanford, Jr., he gave $20,000,000 for the founding of Leland Stanford University at Palo Alto, Cal. He died in Palo Alto, June 21, 1893.

Stanhope, the name of a noble English family. James, 1st Earl Stanhope; born in Paris, France, in 1673. He entered the army, served as Brigadier-General under the Earl of Peterborough at the capture of Barcelona in 1705, was appointed Commander-in-Chief of the British forces in Spain, and in 1708 took Port Mahon. After the accession of George I. he devoted himself to politics, and became the favorite minister of that monarch. He died in London, Feb. 5, 1721. Charles, the 3d earl; grandson of the preceding; born in London, England, Aug. 3, 1753; was celebrated chiefly as an inventor, a patron of science, and the avowed advocate of republicanism. His chief inventions were an arithmetical machine and a new printing press, which bears his name. He died in London, Dec. 15, 1816. Philip Henry, 5th earl, grandson of the preceding; born in Walmer, Kent, Jan. 31, 1805. He filled various official positions in the ministry of Sir Robert Peel, but he was best known under his title of Lord Mahon, as the author of a "History of the Succession War in Spain" (1832), a "Life of Belisarius," a "History of England from the Peace of Utrecht to the Peace of Versailles, 1713–1783" (1854), a

"Life of Pitt" (1861), and a "History of the Reign of Queen Anne" (1870). He was the founder of the Stanhope prize for a historical essay in connection with Oxford University. He died in Bournemouth, Hampshire, Dec. 24, 1875. LADY HESTER LUCY, an English traveler; daughter of the 3d Earl Stanhope, born in Chevening, England, Mar. 12, 1776. For many years she resided with her uncle, William Pitt, and when he died in 1806 she received a government pension of $6,000. In 1810 she left England, visited various places in the East, and finally settled in Syria. She established herself in the deserted convent of Mar Elias in the Lebanon, adopted the style and dress of an Arab chief, and by her kindness and masculine energy exercised great influence over the Bedouins. Her "Memoirs" were published in 1845–1846. She died in Mar Elias, Syria, June 23, 1839.

Stanhope Lens, a magnifying lens consisting of two convex surfaces of dissimilar curves, separated by a considerable thickness of glass so adjusted that when the more convex surface is next the eye, small objects on the other surface are in focus.

Stanislaus Augustus, STANISLAUS II., the last King of Poland, son of Count Stanislaus Poniatowski; born in Wolczyn, Lithuania, Jan. 17, 1732. Sent by Augustus III. of Poland on a mission to St. Petersburg, he became a favorite with the grand-princess (afterward the Empress Catherine), by whose influence he was crowned King of Poland at Warsaw in 1764. The nobility, however, were discontented with this interference on the part of Russia, and forcibly compelled the king to abdicate (1771). He protested against the various partitions of Poland, formally resigned his sovereignty in 1795, and finally died in St. Petersburg, Feb. 12, 1798, as a pensioner of the Emperor Paul I.

STANISLAUS II.

Stanislaus Leszczynski, STANISLAUS I., King of Poland, afterwards Duke of Lorraine and Bar; born in Lemberg, Galicia, Oct. 20, 1677. His father was grand treasurer to the Polish crown, and he himself was voivode of Posen, when he was recommended to the Warsaw assembly by Charles XII. of Sweden as a candidate for the vacant throne of Poland. He was accordingly elected and crowned (1705), but after the disastrous battle of Poltava (1709), when his patron Charles XII. was defeated, he had to flee from Poland. He found refuge in France ultimately, where his daughter Maria became wife to Louis XV. Assisted by the French king he sought to establish his claims to the throne of Poland in 1733, but, opposed by the united powers of Saxony and Russia, he had again to retire into France, where he held possession of the duchies of Lorraine and Bar until his death. His writings were published under the title of "Works of the Beneficent Philosopher" (1765). He died Feb. 23, 1766.

STANISLAUS I.

Stanko. See Cos.

Stanley, Arthur Penrhyn, an English clergyman; son of the Bishop of Norwich, born in Alderley, Cheshire, Dec. 13, 1815; was educated at Rugby under Dr. Arnold (1829–1834). As a scholar of Balliol, he gained the Newdigate, Ireland, and other university distinctions; took a first class in classics (1837); and was elected fellow of University College (1840). Taking orders, he was for 12 years tutor of his college; Select Preacher (1845–1846); secretary to the Oxford University Commission (1850–1852); canon of Canterbury (1851–1858); Regius Professor of Ecclesiastical History and canon of Christ Church (1858–1864); in 1863 declined the archbishopric of Dublin; and became next year the Dean of

Westminster. St. Andrews University conferred on him the degree of LL.D. (1871), and he was installed its rector (1875). He made a tour in the East (1852–1853), and again as chaplain to the Prince of Wales (1862), performed the Protestant marriage of the Duke of Edinburgh at St. Petersburg (1874), and visited the United States (1878). The leader after Maurice's death of the "Broad Church" party, he showed sympathies with free thought by his action in the "Essays and Reviews" and Colenso controversies; by his presence at the second "Old Catholic" Congress; by invitations to Dissenters and Max Müller to preach or lecture in the Abbey. Among his numerous publications are the "Life of Arnold" (1844, 9th ed. 1875); "Sermons and Essays on the Apostolic Age" (1846, 3d ed. 1874); "Memoir of Bishop Stanley" (1850); "Epistles to the Corinthians, with Notes and Dissertations" (1854, 4th ed. 1876); "Historical Memorials of Canterbury Cathedral" (1854, 6th ed. 1872); "Sinai and Palestine" (1855, 20th ed. 1874); "Lectures on the Eastern Church" (1861, 4th ed. 1869); "Lectures on the Jewish Church (3 series, 1862–1875, 7th ed. 1877); "Historical Memorials of Westminster Abbey" (1867, 4th ed. 1874); "Essays on Questions of Church and State from 1850 to 1870" (1870); "The Athanasian Creed (1871); "Lectures on the Church of Scotland" (1872); and "Addresses and Sermons at St. Andrews" (1877). He married in 1863 Lady Augusta Bruce, daughter of the 7th Earl of Elgin, who was born April 3, 1822; resided constantly with Queen Victoria (1846–1863); and died at the Deanery, Westminster, March 1, 1876. He died in his Deanery, July 18, 1881, and was buried in the chapel of Henry VIII., Westminster Abbey.

Stanley, Henry Morton, an American explorer; born near Denbigh, Wales, in 1840; name originally John Rowlands. When three years old he became an inmate of the poorhouse at St. Asaph, where he made such progress in the school that he was employed as a teacher of other children at Mold, Flintshire, when he went away at the age of 13. Two years later he sailed as cabin boy on board a vessel bound for New Orleans, and in that city he found a friend in a merchant, who adopted him and gave him his own name, but died leaving no will. Young Stanley, left to his own resources, went to California, where he sought his fortune in the gold mines. When the Civil War broke out he became a soldier in the Confederate army. He was made prisoner, and subsequently took service in the United States navy, becoming acting ensign on the iron clad "Ticonderoga." After the close of the war he became a newspaper correspondent, writing a series of letters from Crete and Asia Minor. When the English expedition was sent against King Theodore of Abyssinia in 1867 he accompanied it as commissioner of the New York "Herald." He made his reputation as a correspondent by sending an account of Lord Napier's victory to London before the official dispatches arrived. In 1868 he went to Spain to report the Carlist War for the same paper. He was called away from there in October, 1869, to go in search of Dr. David Livingstone in Africa, from whom no news had been received for more than two years, and who was reported to have been killed, but whom James G. Bennett, proprietor of the "Herald," believed to be still alive. When he arrived in Paris he was directed to act according to his own plans and do what he thought best, but to "find Livingstone." He started, reaching Zanzibar early in January, 1871. There he organized a large expedition of 192 men, which he sent off in five parties. His objective point was Ujiji, which he reached, and found Livingstone, Nov. 10, 1871. After remaining with the veteran Scotch missionary and explorer four months he returned, Livingstone refusing to give up his enterprise till he had completed his work. Stanley arrived at Zanzibar in May, 1872. In 1874 he set out on a second African expedition for the "Herald" and London "Daily Telegraph." At Zanzibar he learned that Livingstone had died in the autumn on the shore of Lake Bangweolo. He reached Victoria Nyanza in February, 1875. He was the first to circumnavigate Victoria Lake, and discovered the Shimeeyu river. He reached England again in February, 1878. Then came the Belgian enterprise, out of which was developed the Free State of Kongo, with Stanley as its conductor, with large means at his disposal. Near the close of 1886 Stanley, under the auspices of the Egyptian government and of English societies and individuals, undertook an expedition for the relief of Emin Pasha, who had of his own will continued to exercise the functions of Egyptian government of the Equatorial Province after the Sudan was abandoned. For this purpose he left England in January, 1887, and returned in 1890, after escorting Emin Bey and a large troop of followers from the interior to the coast. Stanley's last journey in Africa lasted 1,012 days, of which hardly 20 were devoid of perils and tragic incidents. The cost of the expedition was $150,000. He wrote "How I Found Livingstone," "Through the Dark Continent," "Congo and the Founding of its Free State," "Slavery and the Slave Trade," "In Darkest Africa," "Through South Africa," etc. He was made a D. C. L. of Oxford University in 1890, and the same year was married to Miss Dorothy Tennent in West-

minster Abbey. In 1890–1891 he made a lecturing tour of the United States, and in 1895 was elected to the British House of Commons. He died May 10, 1904.

Stanley, Thomas, an English scholar, translator of Æschylus and historian of philosophy; born in Comberlow, Hertfordshire, in 1625. He had Fairfax, translator of Tasso, for private tutor, and studied at Cambridge, passing M. A. in 1641. He also had the Oxford master's degree, though he does not seem to have studied there. He became a member of the Middle Temple, and practised law throughout life, though his best energies were given to literature. He published translations from the Greek, Latin, French, Spanish, and Italian poets; but his great works were the "History of Philosophy" (4 vols. 1655–1662) and an edition of Æschylus, with Latin translation and commentary (1663–1664). The former deals only with Greek philosophy, and is based on Diogenes Laertius; but it was long a standard work, having been translated into Latin by Leclerc and others. The Æschylus was generally considered to surpass its predecessors; the best edition was that edited by Butler in 1809–1816. Stanley died in London, April 12, 1678.

Stanley Falls, a cataract, and also a trading station, on the Kongo, 1,413 miles from the mouth of the river. Stanley Falls Station is at the head of navigation for good-sized vessels, and is in the heart of equatorial Africa. Here is an important entrêpot of the African International Association.

Stanley Pool, a lake-like expansion of the Kongo, 250 square miles in extent, dotted with islands, 325 miles from the sea. Kallina Point marks its lower extremity, and Inga Peak dominates the entrance to the united river above the pool. The shores are somewhat precipitous, and there are many native villages in the vicinity. The current of the Kongo is very swift at this spot, and the clay banks are constantly being undermined by the flood. Stanley Pool is an important station of the African International Association, and several bodies of missionaries are laboring there.

Stannamyl, compounds produced by the action of amylic iodide on an alloy of sodium and tin. The product contains the three compounds, $Sn^{ii}(C_5H_{11})_2$, $Sn^{iii}{}_2(_5H_{11})_6$, and $Sn^{iv}(C_5H_{11})_4$, homologous with the stannethyls. They are all unctuous masses, and do not fume in the air, insoluble in water, soluble in alcohol in proportion as they contain less tin. The stannamyls reduce silver solutions, and are oxidized by nitric acid.

Stannard, Mrs. (Henrietta Eliza Vaughan Palmer), an English novelist, writing under the pseudonyms JOHN STRANGE WINTER and VIOLET WHYTE; born in York, England, Jan. 13, 1856. She wrote among others: "Cavalry Life" (1881); "Regimental Legends" (1883); "Bootles's Baby" (1885), very popular; "Houp-la" (1885); "A Siege Baby" (1887); "Only Human"; "Grip"; "Heart and Sword"; and over 40 other novels.

Stannaries, the mines from which tin is dug. The term is most generally used with reference to the peculiar laws and usages of the tin mines in the counties of Cornwall and Devon, England. By an early usage peculiar to these counties, the prerogative of the crown, elsewhere reaching only to gold and silver mines, is extended to mines of tin, which are the property of the sovereign, whoever be the owner of the soil. A charter of King John to his tinners in Cornwall and Devonshire, of date 1201, authorized them to dig tin, and turf to melt the tin, anywhere in the moors, and in the fees of bishops, abbots, and earls, as they had been used and accustomed — a privilege afterward confirmed by successive monarchs. When Edward III. created his son, the Black Prince, Duke of Cornwall, he at the same time conferred on him the stannaries of Devon and Cornwall, which were incorporated in perpetuity with the duchy. Their administration is committed to an officer called the Lord Warden of the Stannaries, who has two substitutes or vice-wardens, one for Cornwall and one for Devon. In former times representative assemblies of the tinners (called parliaments) were summoned by the warden under a writ from the Duke of Cornwall, for the regulation of the stannaries and redress of grievances: the last of them was held in 1752. The Stannary Courts are courts of record held by the warden and vice-warden, of the same limited and exclusive character as the Courts-palatine, in which the tinners have the privilege of suing and being sued. They were remodelled and regulated by a series of acts of Parliament. Appeals from these courts are now taken to the Court of Appeals, and there is a final appeal to the House of Lords. In Cornwall the right to dig tin in unenclosed or "wastrel" lands within specified bounds may be acquired by one who is not the owner of the lands, on going through certain formalities, the party acquiring this right being bound to pay one-fifteenth to the owner of the lands. An ancient privilege, by which the Duke of Cornwall had the right of preëmption of tin throughout that county, has long fallen into abeyance.

Stannate of Potassium, K_2SnO_3; prepared by dissolving stannic acid in potash ley, and evaporating over sulphuric acid. It is gummy, uncrystallizable, and strongly alkaline, very soluble in water, but insoluble in alcohol.

Stannate of Sodium, Na_2SnO_3; prepared by dissolving stannic acid in soda ley, and evaporating over sulphuric acid. It is a crystallo-granular body, and is less soluble in warm than in cold water, insoluble in alcohol. Used in calico printing as a mordant, chiefly for mixtures of wool and cotton.

Stannethyl, ethyl compounds of tin. Three of these are at present known; viz., stannous ethide, $Sn^{ii}_2(C_2H_5)_2$, stannoso-stannic ethide, $Sn^{iii}_2(C_2H_5)_6$, and stannic ethide $Sn^{iv}(C_2H_5)_4$, the first and second acting as organic radicles, capable of uniting with chlorine, bromine, oxygen, etc., and the third being a saturated compound.

Stannic Acid, H_2SnO_3; obtained by adding barium or calcium carbonate, not in excess, to a solution of stannic chloride. When recently precipitated, it is gelatinous; but after drying in the air it forms hard translucent lumps like gum arabic. In dissolves in the stronger acids forming stannic salts, and forms easily soluble salts with the alkali metals.

Stannic Ethide, $Sn^{iv}(C_2H_5)_4$; stannotetrethyl, a transparent colorless liquid obtained by the distillation of stannous ethide. It has a faint ethereal odor and metallic taste, sp. gr. 1.19, boils at 181°, and is very inflammable, burning with a dark blue-edged flame. It dissolves iodine with a brown color which gradually disappears.

Stannine, or **Stannite,** an ore of tin, now of rare occurrence, but formerly found in a few mines of Cornwall in fair quantity. Crystallization undetermined, but probably tetragonal; found mostly massive; hardness, 4.0; sp. gr. 4.3–4.5; luster, metallic; streak, blackish; color, steel-gray, sometimes with a bluish tarnish; opaque; brittle. Composition: Sulphur, 29.6; tin, 27.2; copper, 29.3; iron, 6.5; zinc, 7.5 = 100.1. Under the name stannite, Breithaupt has described an amorphous pale-yellow mineral, which, with much tin oxide, contains also much silica. Now shown to be quartz, in which finely divided cassiterite is mechanically suspended.

Stannmethyl, methyl compounds of tin; compounds analogous in constitution to the stannethyls, and resembling them generally in their properties and modes of formation. Three of these are known, viz., stannous methide, $Sn^{ii}(CH_3)_2$, stannoso-stannic methide, $Sn^{iii}(CH_3)_6$, and stannic methide $Sn^{iv}(CH_3)_4$.

Stannoso-stannic Ethide, $Sn^{iii}_2(C_2H_5)_6$; stannotriethyl; a slightly yellow refractive oil obtained by digesting an alloy of sodium and tin with ethyl iodide, exhausting the mass with ether, evaporating the ethereal solution, and washing the residue with alcohol. It has a peculiar odor, resembling that of rotten fruit, is insoluble in water and alcohol, soluble in ether, and boils at 180°.

Stannous Ethide, $Sn^{ii}(C_2H_5)_2$; stannodiethyl; a thick yellowish oil obtained by heating ethyl iodide and tin-foil in a sealed glass tube to 160°, and decomposing the resulting iodide with sodium of zinc. It has a pungent odor, is insoluble in water, soluble in alcohol and ether, sp. gr. 1.558, does not solidify at −12°, and cannot be distilled without decomposition.

Stanovoi, or **Yablonoi,** a mountain chain in the N. E. of Asia, which forms the boundary between Siberia and Manchuria, skirts the Sea of Okhotsk, and is continued though with gradually diminishing height, to the shores of Bering Strait. The whole length of the chain has been estimated at 3,000 miles. The E. part is often distinctively called Yablonoi. This mountain range gives rise to the rivers Amur and Anadir on its S. and E. side, and to the Yenisei, Lena, Indighirka, and Kolyma on the N. and W. side.

Stanton, Edwin McMasters, an American statesman; born in Steubenville, O., Dec. 19, 1814; was admitted to the bar in 1836; and began to practise in Cadiz, O. He soon rose to eminence and in December, 1860, was appointed Attorney-General of the United States. In 1862 he succeeded Simon Cameron as Secretary of War and held that office for six years. His opposition to President Johnson's plan of reconstruction led the latter to request his resignation in 1867. He refused to resign, but on Aug. 12 surrendered his office under protest to General Grant as secretary ad interim. On Jan. 13, 1868, the United States Senate reinstated him, but the President appointed Adjt.-Gen. Lorenzo Thomas to fill his place. Stanton refused to vacate the office, however, and the impeachment of the President followed. On the President's acquittal, Stanton resigned and resumed law practice. On Dec. 20, 1869, he was nominated by President Grant as an associate justice of the Supreme Court of the United States, but died before taking his seat, in Washington, Dec. 24.

Stanton, Elizabeth Cady, an American reformer; born in Johnstown, N. Y., Nov. 12, 1815; was graduated at Emma Willard's Seminary, in Troy, N. Y., in 1832; called the first Woman's Rights Convention in Seneca Falls, N. Y., in 1848; addressed the New York Legislature on the rights of married women in 1854, and in advocacy of divorce for drunkenness in 1860; and was an unsuccessful candidate for Congress in 1868. She was a member of numerous Woman's Suffrage societies, editor of "The Revolution," and the author of "The History of Woman Suffrage"; "Eighty Years and More"; "The Woman's Bible"; and other works. She died Oct. 26, 1902.

Stanton, Henry Brewster, an American abolitionist; born in Griswold, Conn., June 29, 1805. He married Elizabeth Cady in 1840. He was active in the anti-slavery movements (1837–1841), was admitted to the bar, and gained reputation in patent law (1847); assisted in organizing the Republican party (1858–1860); and from 1868 was an editor of the New York "Sun." He contributed to the "Liberator," wrote much for periodicals, and published: "Sketches of Reform and Reformers in Great Britain and Ireland" (1849); and "Random Recollections" (1886). He died in New York, Jan. 14, 1887.

Stanton, Henry Thompson, an American poet; born in Alexandria, Va., June 30, 1834; received a collegiate education and studied at the United States Military Academy; served in the Confederate army throughout the Civil War, first as captain and later as major. He was employed for a number of years with the United States commissioners in establishing Indian reservations. He designed an iron tie for binding cotton bales, and was the author of "The Moneyless Man and Other Poems" (1872). He died in 1898.

Stanton, Richard Henry, an American jurist; born in Alexandria, Va., Sept. 9, 1812; received an academic education; began practice in Maysville, Ky., was a Democratic member of Congress in 1849–1855, and district judge in 1868–1874. His publications include: "Code of Practice in Civil and Criminal Cases in Kentucky" (1885); "Practical Treaties for Justices of Peace" (1861); "Practical Manual for Executors"; etc. He died in 1891.

Stanton, Theodore, an American journalist, son of Henry B. and Elizabeth Cady; born in Seneca Falls, N. Y., Feb. 10, 1851. He was a correspondent for the New York "Tribune" at Berlin from 1880, and later engaged as a journalist in Paris. He translated Goff's "Life of Thiers" (1879), and wrote: "The Woman Question in Europe" (1881).

Stanza, a number of lines or verses regularly adjusted to each other, and properly ending in a full point or pause; a part of a poem ordinarily containing every variety of measure in that poem; a combination or arrangement of lines usually recurring, whether like or unlike in measure. A stanza is variously termed terzina, quartetto, sestina, ottava, etc., according as it consists of three, four, six, eight, etc., lines.

Stapelia, an extensive and curious genus of plants, natural order *Asclepiadaceæ*, or milk weeds. Most of the species are natives of the Cape of Good Hope. They are succulent plants, without leaves, frequently covered over with dark tubercles, giving them a very grotesque appearance. In most instances the flowers give off a very unpleasant odor, like that of rotten flesh, insomuch that the name of carrion flower has been given to some of these plants. They are, nevertheless, cultivated on account of their singular and beautiful flowers.

Staphylea, a genus of plants, order *Staphyleaceæ*. *S. trifolia*, the bladder nut, is a handsome shrub, six to eight feet high, found in moist woods and thickets from Canada to Carolina and Tennessee. Leaflets oval-acuminate, serrate, pale beneath, with scattered hairs; flowers white, in a short, drooping raceme. The most remarkable feature of the plant is its large, inflated capsules, which are three-sided, three-parted at top, three-celled, containing several hard, small nuts or seeds, with a bony, smooth, and polished testa.

Staphyleaceæ, a small order of plants, alliance Sapindales, included by many botanists in the order *Sapindaceæ*, as a tribe distinguished by the stamens being inserted outside instead of inside the disk, and by albuminous seeds. They consist of trees or shrubs, which are natives of Europe, Asia, and Northern and tropical America.

Staphylinidæ, in entomology, the rove-beetles or devil's coach horses; the typical family of the section Brachelytra. Some recent entomologists make it the only family of the section, and divide it into 11 sub-families, with about 5,000 species. These are spread over the world, occurring in the dung of animals, in decaying animal and vegetable matter, under the bark of trees, in fungi, in ants' nests, etc. They fly abroad in large numbers in warm evenings after sunset. Their larvæ more nearly resembles the adults than in other coleoptera, showing their rank in the order to be low.

Staphyloma, in pathology, the protrusion of part of the eyeball beyond its natural position. When the affection has its seat in the cornea it is called *S. corneæ*; when in the sclerotica, *S. sclroticæ*. It may arise from the ulceration of the cornea, or from the effusion of fluid behind the lens of the eyeball. Called also staphylosis. See Eye.

Staple, the modern form of the Anglo-Saxon word *stapel*, meaning a heap, or regularly piled up accumulation, of goods; hence a place where goods are stored up for sale. In the Middle Ages, when the term was in common use, a staple meant both the trading town for particular commodities and the commodities that were wont to be exposed for sale there. The kings of England from the beginning of the 14th century issued various regulations affecting the staple towns for the sale of England's principal commodity in those ages — wool. In 1313 Edward II. enjoined that all En-

glish merchants trading abroad, in Flanders, Brabant, and the adjacent countries, should carry all their wool to one staple town in Flanders; from 1343 Bruges was the town that enjoyed this privilege. But the men of Bruges greatly hampered the trade, and put vexatious hindrances in the way of the English merchants trading with the towns that lay farther inland; so that in 1353 Edward III. transferred the staple to England, and shared its privileges among half a score of coast towns from Newcastle to Bristol. At the same time all questions in dispute affecting mercantile transactions at these towns were put under the jurisdiction of an officer (one in each town) called the mayor of the staple, who decided all such differences by "merchant law," with the assistance of foreign merchants as assessors.

The change to England, however, which it was hoped would relieve the English merchants from the vexatious interference of foreign governments and advantage the island country by attracting foreign merchants, proved anything but satisfactory, and from about the year 1362 the staple for English wool was almost constantly fixed at Calais, and remained there down to the year 1558. The Scotch merchants had their staple at Campvere, in Holland. But as commerce grew with the lapse of time, it gradually broke down the barriers imposed by the system of staples. This concentration of trade in particular commodities or of particular countries at certain cities and towns was owing to both economic and political reasons. It was a sort of established policy of the Plantagenet kings to regulate trade in the interests of the royal power. Important privileges were accorded to foreign merchants on condition of their agreeing to frequent certain towns for purpose of traffic. This, too, enabled the royal officers of the customs the more readily and easily to collect the revenues of the crown accruing from those sources. And this line of state policy was so far congruent with the requirements of international commerce that it was the means of bringing buyers and sellers together at the same time and in the same place, and that it enabled the merchants trading from or to one town or country, or association of trading-towns, to combine together for their mutual advantage and protection.

A curious evidence of early international interest in fairs, as well as of their importance and influence, is found in the records of 1314, when King Philip of France sent a formal complaint to King Edward II. of England, to the effect that the merchants of England had ceased frequenting the fairs in his dominions with their wool and other goods, to the great loss of his subjects. Philip entreated Edward to persuade, and, if necessary, to compel, English people to frequent the fairs of France as formerly, promising them all possible security and encouragement.

Star, one of the self-luminous bodies which surround our solar system on all sides. They are distinguished from the planets by their flickering light, by the comparative constancy of their relative positions in space, and by their inappreciable diameter even when viewed by the most powerful optical instruments. The number of stars visible to the naked eye is estimated at about 5,000; and these have from an early age been grouped in constellations and classified according to their brightness or magnitude. Those belonging to the first six magnitudes are visible to the naked eye; but the telescope reveals myriads which are distinguished down to the 16th magnitude. The earliest catalogue which has come down to us is that in Ptolemy's "Almagest," supposed to have been compiled by Hipparchus (150 B. C.). Ptolemy gives 1,030 stars, of which several cannot now be certainly identified. The catalogue of Ulugh Begh (15th century), a son of Timur, the Tartar monarch, is founded on Ptolemy's, but checked by careful observation and redetermination of the positions of the 1,019 stars which it contains. The last important catalogue before the invention of the telescope was that of Tycho Brahe, who redetermined with still greater accuracy the positions of 1,005 stars. Of modern catalogues, Argelander's "Sternverzeichniss" is the largest, enumerating more than 300,000 down to the ninth magnitude, all situated between the pole and 2° S. of the equator. PROF. BENJAMIN APTHORP GOULD (*q. v.*) extended this catalogue to the Southern Hemisphere at the Observatory of Cordoba, South America.

The large majority of stars are of constant magnitude, but there are certain, known as variable stars, which vary in brightness and vary periodically. Algol, in the constellation Perseus, fluctuates between the second and fourth magnitudes in a period of about three days. Mira in the constellation Cetus is such another star, being usually invisible to the naked eye, but bursting out at intervals of 11 months with the brilliancy of a second or third magnitude star. There are many others, but their variations are not so marked, and are only recognizable by careful observation. At times, stars have suddenly appeared where none were known before. The most remarkable of these are the one described by Tycho Brahe (1572), that observed by Kepler (1604–1606), and the star of 1866 which blazed out suddenly in Corona Borealis. Near the place of the first a small telescopic star now exists, and the last was entered as a ninth-magnitude star in Argelander's catalogue. The spectrum of the 1866 star

as examined by Huggins consisted of a continuous spectrum crossed not only by the usual dark absorption lines, but also by bright lines which corresponded in part with the spectrum lines of hydrogen. In these outbursts are recognized an action probably similar to, but on a grander scale, than the outbursts of the solar protuberances. The general similarity of the stellar spectra to the solar spectrum is a convincing proof, if any further were needed, that our sun is a star, and that the stars are suns with a probable retinue of accompanying planets.

According to the nature of their spectra, stars have been grouped under four types. Type I., of which Sirius, the brightest known star, is a good representative, is characterized by a continuous spectrum with a very few absorption lines crossing it; in type II. the spectrum is crossed by numerous fine lines, as in the sun's spectrum; in type III., to which α Orionis and α Herculis belong, fluted spaces begin to appear; and in type IV., which includes the red stars, fluted spaces only exist. Here there is an evident gradation from the spectrum of few absorption lines to that broken by gaps. According to the accepted theory of spectrum analysis, the former spectrum indicates a higher temperature than the latter, so that here is an evidence of a development in time of each individual star. As a star is cooling, its spectrum passes through all these types, and thus our sun is at a later stage in its life history than Sirius, though it may not be really any older, since it is probably much smaller than Sirius, whose development will therefore be slower. Our sun cannot be compared in size or splendor to some of its distant compeers, not a few of which must present peculiarly complicated systems. Thus the telescope reveals many stars to be really double. This may be due to the fact that two stars happen to be in nearly the same straight line with the earth; but by careful observation over many years it has been established that many of these double stars are physically connected, just as our own earth and the moon are, the one component revolving round the other in a definite period. Comparison of Herschel's observations with the elder Struve's, and of his with the younger Struve's, has proved this beyond a doubt, and observation is constantly adding to our list of real binary stars.

One of the most interesting of these is Sirius, from the irregularity of whose movements Peters and Auwers had concluded that it was accompanied by an attendant star or at least a large planet; and in 1862 such a companion was discovered by the younger Clark in the very direction in which theory had predicted it to be at that time. Its great minuteness renders detection hopeless except in very favorable circumstances. The motions of Procyon indicate a similar doubleness, but its companion has not yet been seen. Triple and multiple stars forming one system are also not uncommon. For instance, μ Herculis, recognized as a double star by Herschel, is really a triple star, the small Herschellian companion having been resolved into two in 1856 by Alvan Clark. An interesting optical property of these binary systems is that the color of the one component is frequently the complement of that of the other. A very remarkable double star is 61 Cygni, whose components have not perceptibly altered their relative position since the time of Struve; and yet that they are physically connected there can be little doubt, since they have both got the same large proper motion. 61 Cygni is also famous as the first star whose distance from the sun was calculated directly from its parallax, *i. e.*, from the angular distance between its positions as viewed from opposite extremities of the earth's orbit. The most probable mean of the various results gives about .5 of a second for this parallax.

This, however, is not the nearest star; it is nearly twice as far away as α Centauri, which according to Henderson has a parallax of $0''.91$, corresponding to a distance of 226,000 times the radius of the earth's orbit, or more than twenty millions of millions of miles (20×10^{12}). In other words, light, which travels at the rate of 236,000 miles per second, takes nearly three years to pass from the nearest fixed star to us. The parallax of at least half the stars of the first magnitude is probably less than one-tenth of a second, so that their average distance is greater than two million radii of the earth's orbit. That the magnitude of the stars may be taken statistically as a measure of their relative distances is quite warrantable, and was the principal upon which Herschel, and after him Struve and others, proceeded in their speculations as to the structure of the stellar universe. For these, however, we must refer to detailed treatises on astronomy. Though, to the naked eye, stars have probably occupied the same relative positions from the earliest of historic times, the telescope reveals that they are not strictly fixed. Many have appreciable proper motions, among others 61 Cygni, as was before noticed. Its annual motion is $5''.2$, which is exceeded, however, by that of Groombridge, 1830, a star of the seventh magnitude, whose proper motion is $7''$. As a general rule, the brightest stars have the greatest proper motion, and stars below the third magnitude move only a few seconds in 100 years.

This motion in the heavens cannot be taken even as an approximate estimate of the velocity with which any star is moving,

since only the portion of the real velocity which is resolved perpendicular to the line of sight is measurable. Spectrum analysis has, however, given us a means of measuring the velocity along the line of sight. The physical meaning of the dark absorption lines which cross the spectra of the sun and stars has been pointed out under SPECTRUM ANALYSIS. They indicate the absence of certain rays of definite refrangibility and wave length from the solar or stellar light which reaches us. Since each star spectrum has its own peculiar lines, these must be due to absorption by the star's own outer envelope or atmosphere. Now, exactly as ocean waves will appear shorter or longer than they really are according as the observer is sailing against or with them, so will the wave length of each individual ray be shortened or lengthened according as we approach or recede from the source of light, and each absorption line in the spectrum, corresponding as it does to a ray of definite wave length, will be displaced toward the violet or red respectively. By comparison with the spectrum of the substance to which a determined portion of these lines corresponds, this displacement may be measured, and from its relation to the particular wave length the ratio of the relative velocity of approach or recession of the star and us to the velocity of light can be calculated. The measurement of such a minute displacement requires extreme delicacy of manipulation, and accounts for discrepancies between results arrived at by different observers. Huggins, the most trustworthy of stellar spectroscopists, assigns to the receding stars Sirius, *a* Orionis, and *a* Geminorum velocities of 20, 22, and 25 miles per second respectively; and to the approaching stars *B* Geminorum, *a* Lyrae, and Arcturus velocities of 49, 50, and 55 miles per second. To get the whole velocities of these stars relatively to our system, these radial velocities must be compounded with their tangential velocities, which can be calculated only from a knowledge of their proper motions and parallaxes. Thus Sirius has an annual motion of 1″ .3, and a parallax of about 0″ .2; consequently its derived tangential velocity of 20 miles per second compounded with its radial velocity gives a total velocity of 28 miles relatively to the solar system. Such applications are, however, still in their infancy, and must lead in time to more certain results.

Star Apple, the popular name of several species of plants of the genus *Chrysophyllum,* natural order *Sapotaceæ,* whose fruit is esculent. *C. Cainito* is the most important species. It is a native of the West Indies. The fruit resembles a large apple, which in the inside is divided into 10 cells, each containing a black seed, surrounded by gelatinous pulp, which is very palatable.

Starboard, the right side of a ship when the eye is directed toward the head, stem, or prow.

Star Catalogues, lists or catalogues of the stars arranged according to their positions, generally their right ascensions and declinations, though some of the early catalogues were arranged according to the positions in latitude and longitude. The early catalogues, and those accompanying uranometries, are arranged in constellations, and then in the order of position under each constellation. This system was of course fit only for the few stars visible with the naked eye. Some catalogues like the great "Durchmusterung" of Argelander and Schoenfeld are arranged in zones of declination of one degree in width, and then in the order of right ascension in each zone. Most of them are arranged in order of right ascension from beginning to end, regardless of the range of declination, this being given in the parallel column with the right ascension. A star catalogue is supposed always to give the position of the star, but these positions, or "places," are given with all degrees of precision. The early catalogues and uranometries give the places only to minutes of arc. Catalogues like the great "Durchmusterung" give the places to seconds or tenths of seconds of time and to tenths of a minute of arc. These are only accurate enough for purposes of identification. Modern catalogues resulting from accurate determinations of position give the places to hundredths of a second of time and tenths of a second of arc. Such catalogues also give the precession of each star in right ascension and declination, in order to reduce the position to any desired epoch, for the places of the stars are always changing, or rather the coördinate plane to which they are referred is always shifting its position on account of the precession of the equinoxes. The epoch of a star catalogue is the date to which its places refer, and is always taken as the beginning of some year, generally some decade or quarter of a century. See GOULD, BENJAMIN APTHORP.

Starch, Preparation of. Starch is a definite chemical principle which occurs in great abundance in the vegetable kingdom, being found at one time or other in all flowering plants. It is found most abundantly in those parts of plants connected with reproduction and propagation, being the largest constituent of farinaceous seeds like those of cereals and pulses, and of tuberous roots such as the potato and the cassava and arrowroot plants, and it also gorges the stems of certain palm trees, especially at the period when they are about to flower. It is only from those sources where

Starch

it is present in large quantity that commercial varieties of starch are obtained. Having regard to the purposes to which starch is applied, the various kinds may be divided into (1) starches used for food and (2) starches used for laundry and industrial purposes, though certain kinds are extensively used under both of these heads.

In their chemical relations all varieties of starch are identical, but in their physical constitution and microscopic structure they present marked differences between each other, and they also vary much as regards digestibility and suitableness as articles of food. Seen under the microscope, the various kinds of starch present the appearance of minute granules made up of a series of layers concentrically surrounding one or sometimes more nuclei. The size of these granules and the arrangement of layers differ in every different species of plant, and therefore the source of any particular starch is readily determined by microscopic examination.

The food starches embrace arrowroot, tous-les-mois, sago, and tapioca, and under that head is also placed the so-called "corn flour," which under a variety of names, such as "Oswego flour," "maizena," etc., is sold for use in the same manner as arrowroot. Corn flour, which has now an enormous sale, is simply the starch of Indian corn or maize separated from the grain by prolonged steeping in water, crushing the swelled grains between cylinders under a flow of water, and washing the mass through a cylindrical sieve so as to separate out the husky matter. The milk-like fluid which contains the starch in suspension is run along a series of gently inclined surfaces, on which the heavier granules are deposited, the lighter and finer particles being carried with nitrogenous matter into settling tanks. The deposit which accumulates in the settling tank is purified by repeated straining and settling, and the separated starch is dried by gentle artificial heat, when it crumbles to a powder, and as such it is packed up for use.

The principal source of starch for industrial purposes are potatoes, wheat, and rice, but sago starch is also extensively employed for other than food purposes; and as very many plants yield the substance, so it is found that starch from many different substances finds occasional or limited employment. As potatoes affected by disease yield as pure and useful a starch as sound tubers, the preparation of potato starch was prosecuted on a great scale in the United Kingdom during the years when potato disease prevailed. In ordinary seasons the trade is more restricted, but on the Continent — in Germany, Holland, and Russia especially — the manufacture is one of importance. On a small scale the preparation of starch from potatoes is a simple operation. The tubers have simply to be thoroughly steeped and washed to free them from all earthy impurity, then rasped down to a fine pulp in a tub of water and allowed to settle, when the starch will fall to the bottom and the greater part of the skin or husk will float on the water. By repeated washing and settling of the starchy deposit the starch may be obtained in a condition of purity, and it may then be dried by gentle heat for preservation and use. On the manufacturing scale machinery of various kinds is adapted for performing the several processes of steeping and washing, straining out of stones, rasping, straining, settling, purifying, draining, and drying which the potatoes undergo. Beyond its use in industrial pursuits in common with other starches, potato starch is much employed for making imitation sago, for adulterating and as a substitute for the more costly food starches, for preparing starch sugar, and as a source of potato spirit.

Wheat starch is prepared by two distinct processes. By the first and old method the grain is subjected to a process of fermentation whereby the gluten or nitrogenous constituent of the wheat is rendered soluble and the remainder of it loses its adhesive property, and in this condition the starch is easily separated out by a washing wheel or drum. By this process the greater part of the gluten is wasted, and a smaller yield of starch is obtained than can be secured by the more recent system of Martin. The principle on which it proceeds can be easily illustrated by making a dough of flour, placing it in a muslin bag, and squeezing it under the water, when the starch exudes mingling with the water and settling as a sediment, leaving within the muslin a grey semi-elastic mass consisting chiefly of gluten. In this way the gluten is saved, and can be utilized for cattle-feeding, etc. By whatever process prepared, wheaten starch is purified by repeated washing and settling, and dried by gentle heat, and on drying it assumes the columnar structure by which it is familiarly known. In the preparation of rice starch, a variety preferred for laundry purposes, the grain has to be steeped in a slightly alkaline solution on account of its peculiarly hard and horny structure. In addition to being most extensively used in laundries, starch is largely consumed in the manufacture of dextrine or British gum, and it is also employed as a thickener in calico printing, and in the finishing of bleached and printed calicoes. A paste of starch is generally used by photographers for mounting prints, and it finds a valuable minor adaptation in dusting molds in metal casting, besides being applied for many miscellaneous purposes.

Medicinal Properties of Starch.— Wheat starch is employed in medicine as an external application to the face and hands when affected by cutaneous eruptions, and to prevent the chafing of the skin of infants. Violet powder used in such cases is merely scented starch. The pharmaceutical preparations of starch are the glycerin and the mucilage. The glycerin, an opaque, soft, solid jelly, is composed of one part of starch and eight of glycerin, prepared by rubbing them well together, heating the mixture gradually to 240°, and stirring till a translucent jelly is formed. The mucilage is prepared by boiling and stirring for a few minutes one part of starch and 40 of water, and is used in enemas, and in surgery to stiffen bandages for fractures, etc.

Star Chamber, a British tribunal which met in the old council chamber of the palace of Westminster, and is said to have received its name from the roof of that apartment being decorated with gilt stars, or because in it "starres" or Jewish bonds had been kept. It is supposed to have originated in early times out of the exercise of jurisdiction by the king's council, whose powers in this respect had greatly declined when in 1487 Henry VII., anxious to repress the indolence and illegal exactions of powerful landowners, revived and remodelled them, or, according to some investigators, instituted what was practically an entirely new tribunal. The statute conferred on the Chancellor, the Treasurer, and the Keeper of the Privy Seal, with the assistance of a bishop and a temporal Lord of the Council, and Chief-justices, or two other justices in their absence, a jurisdiction to punish, without a jury, the misdemeanors of sheriffs and juries, as well as riots and unlawful assemblies. Henry VIII. added to the other members of the court the president of the Council, and ultimately all the privy-councillors were members of it. The resulting tribunal was, during the Tudor age, of undoubted utility as a means of bringing to justice great and powerful offenders who would otherwise have had it in their power to set the law at defiance. It was independent of a jury, and at that time juries were too easily terrorized by the nobles.

The civil jurisdiction of the Star Chamber comprised controversies between English and foreign merchants, testamentary causes, disputes between the heads and commonalty of corporations, lay and ecclesiastical, and claims to deodands. As a criminal court it could inflict any punishment short of death, and had cognizance of forgery, perjury, riots, maintenance, fraud, libels, conspiracy, misconduct of judges and others connected with the administration of the law, and all offenses against the State, in so far as they could be brought under the denomination of contempt of the king's authority. Even treason, murder, and felony could be brought under the jurisdiction of the Star Chamber, where the king chose to remit the capital sentence. The form of proceeding was by written information and interrogatories, except when the accused person confessed, in which case the information and proceedings were oral; and out of this exception grew one of the most flagrant abuses of this tribunal in the later period of its history.

Regardless of the existing rule that the confession must be free and unconstrained, pressure of every kind, including torture, was used to procure acknowledgments of guilt; admissions of the most immaterial facts were construed into confessions; and fine, imprisonment, and mutilation inflicted on a mere oral proceeding, without hearing the accused, by a court consisting of the immediate representatives of prerogative. The proceedings of the Star Chamber had always been viewed with distrust by the commons; but during the reign of Charles I. its excesses reached a pitch that made it absolutely odious to the country at large; the punishments inflicted on Alexander Leighton, Prynne, Burton, and Bastwick brought matters to a height, and in 1641 a bill was carried in both Houses which decreed the abolition of the Star Chamber and the equally unpopular High Commission Court.

Star Charts, maps of the stars showing their relative positions and brightness. They constitute the principal part of the various uranometries, the catalogue accompanying these being generally a subsidiary part, at least in the older ones. Modern uranometries, like the "Uranometria Argentina" of Gould, are an exception to this rule, the catalogue of that being its most important part. Charts of this kind picture the boundaries, and often the figures, of the CONSTELLATIONS (*q. v.*), but the charts of the fainter stars make no attempt to do this, but only show the positions and magnitudes of the stars. The most important charts of this class are those of the great Durchmusterung of Argelander and Schoenfeld, those of Dr. Benjamin A. Gould, of Cambridge, Mass., those of Dr. Peters, of Hamilton College, and those of Chacornac and the Henry brothers, of the Paris Observatory.

Starch Hyacinth, a plant, the *Muscari racemosum*, of the same natural order as the hyacinth, and named from the smell of the flower. Called also musk hyacinth and grape hyacinth.

Stare Decisis, to abide by decisions, the the principle on which law has been built. Precedents, which are simply decisions of former competent tribunals, govern the decisions of particular cases. It is, however, in the power of any court to overrule a

manifestly unjust precedent, and reverse the decision founded on it.

Starfish, in zoölogy, a popular name for any individual of the family *Asteriadæ* or *Asteridæ;* applied specifically to the common starfish, *A.* (*Uraster*) *rubens*, a familiar object on the Atlantic coasts. The body is more or less star shaped, and consists of a central portion, or disk, surrounded by five or more lobes, or arms, radiating from the body and containing prolongations of the viscera; but in some forms the central disk extends so as to include the rays, rendering the animal pentagonal in shape. The integument is of a leathery texture, and is often strengthened by calcareous plates or spines. The mouth is situated in the center of the lower surface of the body, and the anus is either absent or on the upper surface. Locomotion is effected by means of peculiar tube-like processes,

STARFISHES AND BRITTLE STARS.

(1) Common Starfish (*Asterias rubens*); (2) Gibbous Starlet (*Asterina gibbosa*); (3) Common Starfish, reproducing rays; (4) Eyed Cribella (*Cribella oculata*); (5) Lesser Sand-star (*Ophiura albida*).

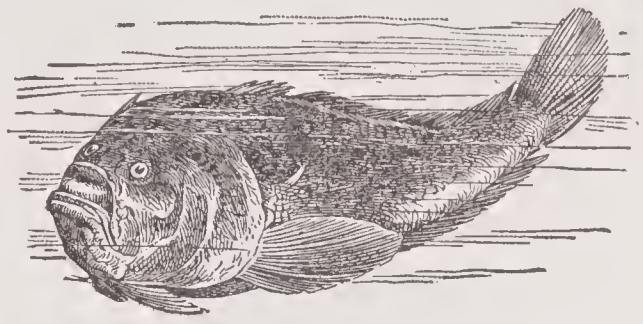
which are protruded from the under surface of the arms. The nervous system consists of a gangliated cord surrounding the mouth, and sending filaments to each of the arms. The young generally pass through a free larval stage, and parthenogenesis seems to occur in Asterias. Starfish are extremely voracious, and are very annoying to fishermen by devouring their bait. They possess in a high degree the power of reproducing lost members and abound in all seas.

Star-Fort, a fieldwork in the shape of a polygon, constructed so that a cross fire may be brought upon the ground before any of its angles. Its defects are the room taken up by the angles and the diminishing of the length of the faces of the fort, and consequently the quantity of the fire from each.

Stargard, an interesting town of East Pomerania, Prussia; on the navigable Ilna,

25 miles E. S. E. of Stettin. Its well-preserved walls are surmounted by handsome towers, and its chief buildings are the Gothic Marienkirche of the 16th century, with richly adorned interior, a Rathhaus of the 11th century, the quaint Protzensche Haus, and a higher Bürgerschule of 1860. It manufactures woolens, linens, leather, etc., and trades in grain and cattle. Stargard, destroyed by the Poles in 1120, was raised to the rank of a town in 1229, joined the Hanseatic League, and was strongly fortified. It played an important part in the Thirty Years' War. Pop. 23,738.

Star Gazer, a species of acanthopterygious fishes of the perch family, the *Uranoscopus scaber*, inhabiting the Mediterra-



A STAR GAZER.

nean, and so called because the eyes are situated on the top of the head and directed toward the heavens. The name is also applied to fishes allied to the carp, of which *Anableps tetrophthalmus* is the best known type. It is found in the rivers of Guiana, and acquires its name of "four eyes" from its prominent and apparently divided eyes.

Stark, John, an American military officer; born in Londonderry, N. H., Aug. 28, 1728; joined the troops under Major Rogers in the war against the French and Indians in 1754; rendered efficient service at Ticonderoga in 1758, and was actively employed in the subsequent campaign. In 1775, after the battle of Lexington he received a colonel's commission, and recruited a regiment which formed the left of the American line at Bunker Hilll. In December, 1776, he marched with his regiment under General Gates to reënforce Washington and was with him at the battles of Princeton and Trenton. In 1777 he resigned his commission, feeling slighted by Congress in its list of promotions. When, however, information was received that Ticonderoga had been taken, he set out at the head of a small force, met and defeated Baum's forces at Bennington, and likewise defeated the British reënforcements of 500 men which Burgoyne had sent to Baum's aid. For this victory he was promoted Brigadier-General and later joined General Gates at Bemis Heights; but the term of his militia having expired, he returned to New Hampshire

and recruited a new force. With these he cut off Burgoyne's retreat from Saratoga, and in 1778 was placed in command of the Northern Department. Later he served in Rhode Island, New Jersey, and at West Point in 1779-1780; and was one of the court which condemned Major André. After the war he returned to his farm. He died in Manchester, N. H., May 8, 1822.

Starling, in ornithology, a popular name for any individual of the genus *Sturnus*, sometimes extended to the whole family but specifically applied to *S. vulgaris*, the common starling, abundant in most parts of the continent of Europe, frequently visiting Northern Africa in its winter migrations. The male is about eight inches long, general color of the plumage black, glossed with blue and purple, the feathers, except those

STARLING.

of the head and fore neck, having a triangular white spot on the tip. The female is very similar, but has the feathers tipped with broader spots, those on the upper parts being light brown. The eggs are from four to six in number, light blue in color and are deposited in some hole or crevice on a scanty lining. Starlings feed on snails, worms, and insects; they are gregarious, uniting in large flocks, and may be readily distinguished from all other birds by their whirling method of flight. They become exceedingly familiar in confinement, and display great imitative powers, learning to whistle tunes and to articulate words and phrases with great distinctness.

Starlings, in architecture, structures of piles driven round the piers of a bridge for their defense and support.

Starnosed Mole, a North American genus (*Condylura*) of moles, distinguished by bearing at the extremity of their muzzle a remarkable structure of fleshy and somewhat cartilaginous rays disposed in the form of a star.

Starodub, a town of Russia, in the province of Tchernigov; on the Bodenez, an affluent of the Dnieper; 85 miles S. W. of Briansk. It is the center of a rich agricultural district, but its trade is checked by the difficulties of transit. Pop. 24,388.

Star of Bethlehem, the celestial phenomenon described in the New Testament as accompanying the birth of Christ. Some astronomers have attempted to account for this on the hypothesis of the conjunction of two or more bright planets in about the same part of the sky at that time, but with little success. At various times since the appearance of Tycho Brahe's star in the constellation Cassiopeia in 1572, the celebrated Nova of that year, it has been suggested that this might be a variable star of long period, though there is nothing now in the vicinity of the place of this star brighter than the 12th or 13th magnitude. Nevertheless, a reported appearance of a bright star in somewhere near that part of the heavens about the middle of the 13th century combined with a still more vague account of some similar appearance a little more than 300 years earlier, furnished plenty of material for conjecture that these might possibly be former appearances of the star of 1572, giving a period of about 310 or 315 years, and a further use of the imagination would carry it back three periods more to about the time of the birth of Christ. This is all the ground there is for supposing any connection between Tycho's star of 1572 and the Star of Bethelehem. Astronomers, since the invention of the telescope, have kept a pretty close watch of the few faint stars in the immediate vicinity of the place indicated by Tycho Brahe's measures to see if any of them changed in brightness, but without any evidence of such change. Nevertheless, some years ago, as it was getting to be about time for another appearance of the star on the 310 or 315 years hypothesis, the story was revived again, and the newspapers were filled with accounts of the so-called predicted reappearance of the "Star of Bethlehem," but no such appearance came, and none is likely to. There is no good reason for supposing any such periodicity in the star, or any other star now known.

Star of Bethlehem, in botany, *Ornithogalum umbellatum;* natural order *Liliaceæ;* a bulbous-rooted plant with white star-like flowers. It is common in many parts of Europe and is naturalized in some of the United States.

Star of the North, the State of Minnesota is sometimes alluded to by this title, because of the motto on its coat of arms; "*L'Etoile du Nord*" (Star of the North).

STAR OF BETHLEHEM.

Starosts, in Poland, those noblemen who were reckoned among the dignitaries of the land, and who received a castle or landed estate from the crown domains. Some of the starosts had civil and eriminal jurisdiction over a certain distriet, others merely enjoyed the revenues of the starosty.

Star Places, the name generally used to indicate the positions (the right ascensions, and deelinations) of stars at some given epoch. These are obtained from STAR CATALOGUES (*q. v.*) which embody the results of observations of the positions, and the places are brought up from one epoch to another by applying the preeession (and proper motion if known) of the star for the interval between the two epochs. There are what are known as fundamental systems of star plaees, generally depending on the work of some one astronomer who has carefully diseussed a large mass of observations of various observatories. The best known of these is Answer's system, which depends mostly on the observations of the Pulkova Observatory for the modern positions of the stars, and on the eomparison of these with Bradley's observations at Greenwich, about 1755, for the determination of the proper motions of the stars of his system. Next in importance to this is the system of star declinations of Professor Boss, Director of the Dudley Observatory. These declinations are used as the basis of the star places of the "Ameriean Ephemeris," and there is considerable evidence that they are somewhat superior to those of Auwers. But as they have no corresponding system of right ascensions they are not so widely known or used.

Starr, Ella, an American journalist; born in New York city; was graduated at the Normal College there; and was on the "Tribune" staff for many years. A book of Shakespearean tales arranged for children and one on "Mythology" were left unfinished at her death in Fishkill, N. Y., Feb. 14, 1902.

Starr, Eliza Allen, an Ameriean author; born in Deerfield, Mass., Aug. 29, 1824; took a course in art which she afterward taught in Brooklyn, Philadelphia, and Natehez, Miss. In 1856 she settled in Chieago, Ill., and devoted her time to teaehing her profession and to literary work. Her publieations include "Poems" (1867); "Patron Saints" (1871); "Pilgrims and Shrines" (1878); "Songs of a Lifetime" (1887); "Isabella of Castile" (1889); "What We See" (1891); "Christian Art in Our Own Age" (1891); "Three Keys to the Cameradella Signature of the Vatican" (1895); "Seven Dolors of the Blessed Virgin Mary" (1898); "The Three Arehangels and Guardian Angels in Art" (1899); etc. In 1900 she received a cameo medallion from Pope Leo XIII. in reeognition of her literary work. She died in Durand, Ill., Sept. 9, 1901.

Starr, Frederick, an Ameriean educaeator; born in Auburn, N. Y., Sept. 2, 1858; was graduated at Lafayette College in 1882; was Professor of Scienees at the State Normal Sehool, Lock Haven, Pa., in 1883–1884; had charge of the Department of Anthropology at the Ameriean Museum of Natural History in 1889–1891. He was ealled to the ehair of anthropology at the University of Chicago in 1893. His publieations inelude: "On the Hills"; "Some First Steps in Human Progress" (1895); "Indians of Southern Mexico" (1899); "Strange People"; etc.

Starr, Louis, an American physician; born in Philadelphia; was graduated at Haverford College, Pa., in 1868, and at the Medical Department of the University of Pennsylvania in 1871; beeame prominent by his treatment of children's diseases; was Clinical Professor of the Diseases of Children at the University of Pennsylvania in 1884–1890. His publications inelude "Diseases of Digestive Organs in Infancy and Childhood" (1888); "Hygiene of the Nursery" (1888); "Diets for Infants and Children in Health and in Disease" (1896); "A Synopsis of the Physiological Action of Medicines" (1877); etc.

Star Reed, a Peruvian plant of the genus *Aristolochia*, the *A. fragrantissima*, the root of which is highly esteemed in Peru as a remedy against dysenteries, ma-

lignant inflammatory fevers, colds, rheumatic pains, etc.

Star Routes, a term used in connection with the United States postal service. Prior to 1845 it was the custom in letting the contracts for the transportation of inland mails, other than by railroad or steamboat routes, to give the preference to bidders who offered stage or coach service. This was abolished by act of Congress, March 3, 1845, which provided that the postmaster general should let all such contracts to the lowest bidder tendering sufficient guarantee for faithful performance, without any condition except to provide for due celerity, certainty and security of transportation. These bids for such service became classified as "celerity, certainty and security bids," and for brevity were designated on the route registers by three stars (***) and known as star routes. These routes vary in length from a fraction of a mile up to several hundred miles, the longest one in operation in 1899 being that from Juneau, Alaska, via Circle in the same territory, along the Yukon river to Tanana, a distance of 1,618 miles, connecting at the last named point with the next longest route which runs from Tanana to St. Michaels, a distance of 900 miles.

Early in 1881 rumors were in circulation of extensive frauds in this branch of the mail service. It was charged that there was a "ring" to defraud the government in which were included some of the large contractors, the Second Assistant Postmaster-General, some of the subordinates in the department, a United States Senator, and others. Proceedings were begun, but no conviction was secured either on these charges or on others which were made in 1883.

Stars and Bars, the flag of the Confederate States of America. It was merely an adaptation of the stars and stripes, having three "alternate stripes red and white," instead of 13 such stripes, and a circle of white stars on a blue field, corresponding to the number of States of the confederacy.

Stars and Stripes, the national banner of the United States.

Star Shoot, or **Star Shot,** a gelatinous substance often found in wet meadows, and formerly supposed to be the extinguished residuum of a shooting star. It is, however, of vegetable origin, being the common nostoc.

Star Spangled Banner, the national banner of the United States. First applied to the American flag by Francis S. Key on the morning after the British attack on Fort McHenry, at Baltimore, in 1814.

Star Stone, a rare variety of sapphire. When cut, and viewed in a direction perpendicular to the axis, it presents a peculiar reflection of light in the form of a star.

Star Thistle, a British plant, *Centaurea Calcitrapa,* which grows in gravelly, sandy, and waste places in the middle and S. of England, especially near the sea, and is remarkable for its long spreading spiny bracts. The yellow star thistle (*Centaurea solstitialis*) is occasionally seen in fields and waste places, principally in the E. and S. of England, and near Dublin, Ireland. It is also called St. Barnaby's thistle. The *C. Americana,* native in Arkansas and Louisiana, has very showy, pale-purple heads.

Star Types, the typical classes into which astronomers divide the fixed stars according to their spectra. They are: (1) the white or Sirian stars; (2) the yellow or solar stars; (3) the red and orange or variable stars; (4) the deep red stars. More than 50 stars have spectra different from any of these types, and they are known as the bright-line stars. Most of the stars in Orion exhibit a special variety of spectra seldom met with outside of that constellation.

Starvation, or **Inanition,** the physical effect produced by the total want of food and water. The symptoms of starvation in man are: an increasing loss of weight, severe pain in the stomach, loss of strength, sleeplessness, great thirst, in some cases stupor, and in other cases nervous excitement with convulsions. Meanwhile the face assumes a haggard expression, the skin is said to become covered with a brown secretion, and at last death occurs in about eight days. With a good supply of water, however, life may be prolonged, in the absence of solid food, for a period of two or three weeks, and a moist atmosphere would even seem to favor the prolongation of life. Certain diseases, such as stricture or cancer of the opening to the stomach, etc., may occasion starvation, and it is to be noted that gradual starvation may result from the continued low percentage of nutritive matter in the daily diet.

State, a whole people united into a body politic; a civil and self-governing community. Also, any body of men constituting a community of a particular character in virtue of certain political privileges, who partake either directly or by representation in the government of their country; an estate; as, The Lords spiritual and temporal and the Commons are the states (or estates) of the realm in Great Britain.

In the plural, the legislative body in the island of Jersey, England. It consists of 55 persons, including the bailiff of the island, who is *ex officio* president. The lieutenant-governor has a power of veto, and

the States may not be convened without his consent. Guernsey has an analogous body, the Deliberative States, and a more popular assembly, the Elective States. In both islands the States deal only with questions of internal administration.

Also, one of the commonwealths or bodies politic which together go to compose a federal republic, and which stand in certain specified relations with the central or national government, and, as regards internal affairs, are more or less independent; as, the State of Pennsylvania.

State, one of the members of the North American federation or union. The erection of the constituent members of the Union into their present status and reciprocal relations may be said properly to have begun with the formal ratification of the first Constitution of the United States, the order of which, by States, is given below. Prior to this action on their part the colonies had occupied simply the position of a congeries of provinces banded together for mutual defense, and having no other organic union than a common legislative body composed of delegates sent from each colony, which delegates might be withheld and all connection with the general body dissolved by the independent action of any one of the commonwealths composing it. The first to enter the sisterhood of States by ratifying the Constitution was Delaware, which, on Dec. 7, 1787, unanimously voted its adoption; then followed Pennsylvania, Dec. 12, 1787, vote 46 to 23; New Jersey, Dec. 18, 1787, unanimously; Georgia, Jan. 2, 1788, unanimously; Connecticut, Jan. 9, 1788, vote 128 to 40; Massachusetts, Feb. 6, 1788, vote 187 to 168; Maryland, April 28, 1788, vote 63 to 12; South Carolina, May 23, 1788, vote 149 to 73; New Hampshire, June 21, 1788, vote 57 to 46; Virginia, June, 1788, vote 89 to 79; New York, July 26, 1788, vote 30 to 28; North Carolina, Nov. 21, 1789, vote 193 to 75; Rhode Island, May 29, 1790, vote 34 to 32. It will thus be seen that Delaware is really the oldest State in the Union, while Rhode Island is the youngest. After the ratification of the Constitution and the entrance into statehood by the 13 original parties to the contract, the other members of the Union were admitted by act of Congress, upon their own petition and authority in the following order:

Alabama	Dec. 14, 1819
Arkansas	June 15, 1836
California	Sept. 9, 1850
Colorado	Aug. 1, 1876
Florida	March 3, 1845
Idaho	July 3, 1890
Illinois	Dec. 3, 1818
Indiana	Dec. 11, 1816
Iowa	Dec. 28, 1846
Kansas	Jan. 29, 1861
Kentucky	June 1, 1792
Louisiana	April 30, 1812
Maine	March 15, 1820
Michigan	Jan. 26, 1837
Minnesota	May 11, 1858
Mississippi	Dec. 10, 1817
Missouri	Aug. 10, 1821
Montana	Nov. 8, 1889
Nebraska	March 1, 1867
Nevada	Oct. 31, 1864
North Dakota	Nov. 2, 1889
Ohio	Jan. 19, 1803
Oregon	Feb. 14, 1859
South Dakota	Nov. 2, 1889
Tennessee	June 1, 1796
Texas	Dec. 29, 1845
Utah	Jan. 14, 1896
Vermont	March 4, 1791
Washington	Nov. 11, 1889
West Virginia	June 19, 1863
Wisconsin	May 29, 1848
Wyoming	July 10, 1889

(In 1910 Congress passed an Act for the admission of Arizona and New Mexico.)

After the conclusion of the Civil War, for a time the seceding States were deprived of statehood and were subjected to military territorial rule. Gradually, however, a reconstruction of the organic government of the States was accomplished, and they were readmitted into full fellowship in the galaxy of States. The government of each State is an autonomy, and each is the supreme judge of its own laws, except so far as affected by the laws and Constitution of the United States, the superior power of which is granted expressly in the compact of union. The chief executive is a governor elected by the people for terms of varying length. The legislative body is composed of two houses, an upper and lower, also elected by the people; while the judiciary is selected by varying methods, in some States being elected directly by the people, in others by the Legislature, and in still others appointed (in some instances) by the governor. Each State has in the National Congress two senators and a number of representatives in the lower house based on the population of the State. The following table shows the basis of representation at different periods, and also the number of representatives to which each State is entitled. In presidential elections each State is entitled to select as many presidential electors as it has National representatives and senators combined.

RATIO OF REPRESENTATION IN THE UNITED STATES HOUSE OF REPRESENTATIVES:

1789 to 1793 provided by U. S. Constitution		30,000
1793 to 1803 based on the U. S. Census of	1790	33,000
1803 to 1813 based on the U. S. Census of	1800	33,000
1813 to 1823 based on the U. S. Census of	1810	35,000
1823 to 1833 based on the U. S. Census of	1820	40,000
1833 to 1843 based on the U. S. Census of	1830	47,700
1843 to 1853 based on the U. S. Census of	1840	70,680
1853 to 1863 based on the U. S. Census of	1850	93,420

1863 to 1873 based on the U. S. Census of	1860	127,381
1873 to 1883 based on the U. S. Census of	1870	131,425
1883 to 1903 based on the U. S. Census of	1880	151,912
1893 to 1903 based on the U. S. Census of	1890	173,901
1903 to 1913 based on the U. S. Census of	1900	194,182

ELECTORAL VOTE AND NUMBER OF CONGRESSIONAL REPRESENTATIVES OF EACH STAFF:

States.	Electoral Votes.	No. Representatives.
Alabama	11	9
Arkansas	9	7
California	10	8
Colorado	5	3
Connecticut	7	5
Delaware	3	1
Florida	5	3
Georgia	13	1
Idaho	3	1
Illinois	27	25
Indiana	15	13
Iowa	13	11
Kansas	10	8
Kentucky	13	11
Louisiana	9	7
Maine	6	4
Maryland	8	6
Massachusetts	16	14
Michigan	14	12
Minnesota	11	7
Mississippi	10	7
Missouri	18	15
Montana	3	1
Nebraska	8	6
Nevada	3	1
New Hampshire	4	2
New Jersey	12	10
New York	39	37
North Carolina	12	10
North Dakota	4	2
Ohio	23	21
Oregon	4	2
Pennsylvania	34	32
Rhode Island	4	2
South Carolina	9	7
South Dakota	4	2
Tennessee	12	10
Texas	18	16
Utah	3	1
Vermont	4	2
Virginia	12	10
Washington	5	3
West Virginia	7	5
Wisconsin	13	11
Wyoming	3	1

State, Ship of, a symbolic term for a nationality.

State University of Kentucky, a co-educational, non-sectarian institution in Lexington, Ky.; opened in 1865; has endowment exceeding $165,000; grounds and buildings valued at over $875,000; volumes in the library, about 7,500; scientific apparatus, etc., $95,000; average number of faculty, 60; average student attendance, 770; graduates, over 800.

State, Department of, an executive department of the United States government, established by Act of Congress, July 27, 1789. At its head is the Secretary of State, who is appointed by the President and confirmed by the Senate and who is a member of the Cabinet. Through him communication is made between the United States government and any of the States or any foreign country. He has charge of the great seal of the United States; of all ambassadors and consuls, and in his custody are all engrossed copies of the laws of the United States and all treaties.

Staten Island, an island comprising Richmond co., N. Y., and Richmond borough, New York city; bounded N. by the Kill von Kull, E. by New York Bay, S. S. E. by Raritan Bay and the Lower Bay, and W. by Staten Island Bay; about 13 miles long with an extreme width of 8 miles; area, 58½ miles. The island is generally very hilly. It contains the towns of Castleton, Middletown, Northfield, Southfield, and Westfield, in which are the villages of Tottenville, Port Richmond, Linoleumville, Edgewater, Stapleton, Tompkinsville, and New Brighton. At the Narrows on the E. shore are Fort Wadsworth and a line of water batteries; on the Lower Bay are Midland Beach and South Beach, summer resorts; and on the N. shore is the Sailors' Snug Harbor, a home for infirm and aged seamen. There are excellent ferry and railroad facilities. Pop. (1910) 85,969.

Staten Island, an island off the S. E. coast of Tierra del Fuego, separated from the mainland by the Strait of Le Maire.

State Militia. See MILITIA, STATE.

State of Frankland. See FRANKLAND.

Stater, in numismatics, the name of certain coins current in ancient Greece and Macedonia. The gold stater of Athens was worth about $3.89; the silver stater about 86 cents, and the Macedonian gold stater $5.11.

State Religion. A State religion and a national religion are two different things, A nation may, with more or less of universal concurrence, accept a certain type of religion—as the people of the United States for the most part accept Christianity—yet they may not commit to their government the task either of representing officially or of maintaining financially their religion. In that case it is a national but not a State religion. Wherever, on the other hand, there is either establishment or endowment committed to the government—even if, as in Ireland till 1869, the religion thus favored is very far from being national—there is a State religion. Such a spectacle almost invariably presents itself to view on the first emergence of any people from tribal confusion into national order. China, India, Mesopotamia, Egypt accordingly present us with the first "states" about which anything is known; and in each case we are confronted with a State religion either patronizing or patronized by the civil power. In ancient China, for instance, public worship was regulated down to its minutest details by six ministers of

State, who were responsible even for the sacred music and religious dancing.

A similar phenomenon appears among the crowded races which inhabited ancient Mesopotamia. There, too, the supreme head of the State religion was the king. It is from the ruins of the palaces at Nineveh and Babylon, and not from those of the temples, that the records have been recovered which unfold the sacred history of this remarkable form of State religion. Singularly enough, both in India and in Egypt we have the exact contrary of all this. We find there two forms of State religion, in each of which a priestly caste has gained the supremacy over the regal power. When we cross the sea and come to Southern Europe we find that these vast sullen State religions of the E. river basins have been left behind. Yet even there a State religion came into being, and Greek theology became characteristically transmuted in downright law. Offenses against the State religion were supposed to bring down on army and navy, on agriculture and commerce, the anger of a justly indignant heaven.

With the conversion of Constantine (A. D. 313), of course, all this was entirely changed; but it was only changed by the parts being reversed. The State religion had now become Christian; and paganism was ere long held to have no right to exist. And even when the Roman empire was broken up at all points by the irruption of barbarians, and everything else became changed, still the old-world system of State religions remained unchanged. The Mohammedans, who broke in from the S. E., have always regarded intolerance as a sacred duty; and the Teutonic tribes, who broke in from the N. E., accepted as a matter of course, along with Christianity, its traditional outward forms. But the dangers of such a feeble patchwork of State religions, covering the face of Europe, were manifold. There was first the insidious danger of SIMONY (*q. v.*) — *i. e.*, of a corrupt use of patronage by the laity. Then there was the danger of violent destruction of small State churches in detail by the fierce and greedy barons of the neighborhood; and lastly there was the yet larger peril looming in the future, that each kingdom might finally set up a State religion for itself and thus hopelessly break up the unity of Christendom. To meet and cope with all these dangers some powerful Churchman of large ideas was urgently required, and such a man providentially appeared (1050) in Hildebrand (Pope Gregory VII.). Under his vigorous rule all the existing State religions of Europe were crushed and cramped together into a sort of imperial religion; and for two centuries (till 1300) it seemed as though one all-embracing empire religion were destined to swallow up and destroy all the minor State religions of the world. But when the vast war waged by the papacy in the Crusades had ended in ignominious failure, and when the insensate ambition of men like Innocent III. and Boniface VIII. had roused both France and England to resistance, that great movement of return to State religions (in the proper sense) began which culminated at last in the Reformation.

Out of the seething strife between papal religion and State religion there gradually emerged a third form — democratic religion. It began, naturally enough, in Switzerland — at Zurich and Geneva. It permeated and honeycombed, to their ultimate downfall, the despotisms in Church and State which "concordats" had conspired to establish; till at last the various acts of toleration in England, the secular Constitution of the United States, and the French revolutionary enactments of 1789 and 1830 completed the transformation of every State religion throughout Europe into a congeries of virtually free churches — sometimes with, sometimes without, a survival from the past in the shape of a central establishment fully tolerating all its neighbors. Thus, England and Scotland retain, along with absolute toleration for every other form of religion, modified State churches; while Ireland — like the United States — has none. France accepts, as a religion recognized and maintained by the State, every communion which numbers 100,000 adherents — those at present receiving State payment being Roman Catholics, Protestants, Jews, and (in Algeria) Mohammedans. In Belgium the State does not interfere with the internal affairs of any religious body, but it subsidizes the Roman Catholics, the Protestants, and the Jews. In the German empire there is universal toleration, but the various States subsidize their religious communities in various ways. In Denmark there is full toleration for all, but the State religion is Lutheranism; and the same arrangement prevails in Sweden and Norway.

The most prominent example of a surviving State religion is to be found in Russia. In Austria-Hungary there is liberty for all, but the recognized religions are those of the Roman Catholics (the dominant Church), the Greeks, the Protestants, the Armenians, and the Jews. Even in Greece there is full toleration, though the State religion is that of the Greek Church. In Italy by the "fundamental law of the kingdom" in 1870, the State religion is Roman Catholic, but there is now complete toleration for other forms of faith. In Spain and Portugal the State religion is also Roman Catholic, and toleration is very limited. In Holland Protestants, Roman Catho-

lics, and Jews are subsidized by the State, but there is toleration for all. In Turkey the State religion is Mohammedanism. In Switzerland there is alsolute freedom for every form of faith. On the whole it would seem that the system of State religion is, by the advancing tide of democracy, threatened with extinction.

States-General, so called in contradistinction to the local *états provinciaux*, the only representative assembly of France up to the Revolution. Under the Karolings there was an annual assembly of clergy and nobles, called either the *Champ de Mars* or the *Champ de Mai*, according to the time of meeting, but it had little of a representative character. The States-General properly so called was first assembled by Philippe le Bel in 1302, on the occasion of his disagreements with the Pope. It was composed of representatives of the three estates, nobles, clergy, and *tiers-état* or *bourgeoisie*. It assembled at pretty frequent intervals during the 14th century and not so regularly in the 15th and 16th centuries, being principally occupied with financial matters, though its functions in the imposition of taxation, etc., were very undefined, and its powers were encroached on from time to time by the royal authority. It had no legislative power whatever. The last States-General before the famous one which heralded the Revolution was that held under Louis XIII. in 1614. From that date till May 5, 1789, the crown absorbed the whole functions of taxation as well as of government. The States-General of 1789, almost immediately on its constitution, was resolved by the secession of the representatives of the *tiers-état* into the Assemblée Nationale.

The name States-General is also applied to the legislative body of Holland, lineally descended from the Estates-General of the United Province, which took such a prominent and honorable part in the revolt of the Netherlands.

States of the Church. See CHURCH, STATES OF THE; TEMPORAL POWER.

State Sovereignty. See SECESSION.

State University of Iowa, a coëducational non-sectarian institution in Iowa City, Ia.; founded in 1847; has endowment exceeding $250,000; grounds and buildings valued at over $1,650,000; scientific apparatus, etc., $660,000; volumes in the library, about 88,000; average number of faculty, 150; average student attendance, 2,800; graduates, over 8,000.

Statice, in botany, sea-lavender; the typical genus of *Staticeæ*. Perennial herbs, with radical leaves, and unilateral spikes on a panicled scape; calyx funnel-shaped, plaited, dry, and membranous; petals united at the base, bearing the stamens; styles distinct, glabrous; stigmas filiform, glandular. Known species 50 or 60, from the sea shores in Western Asia and other parts of the North Temperate zone. *S. caroliniana*, the marsh rosemary of this country, has narrow, obovate leaves on long petioles, and bluish-purple flowers. It is one of the most powerful astringents derived from the vegetable kingdom. It has been given with much success in *Cynanche maligna*, aphthæ of the jaws, etc.

Statics, briefly, the dynamics of equilibrium, as kinetics is the dynamics of motion. In modern phraseology they are said to make up together the science of dynamics, since both deal with the effects of forces. According to Newton's first and second laws of motion, change of motion in a given mass indicates the existence of a force which is in the direction in which the change of motion occurs, and is measured by the product of the mass into the rate of this change, or what is called the acceleration. Thus, a falling stone of mass M suffers a constant acceleration g per second; hence the force pulling it down, *i. e.*, its weight, is measured by the product Mg. While the stone is descending, the problem is one of kinetics; but when it reaches the surface of the earth its motion relatively to the earth ceases, there is no acceleration, and the problem becomes statical. We do not conclude, however, that the force which formerly produced the acceleration no longer exists; but rather that its effect is balanced by the action of an equal and opposite force, conditioned by the impenetrability of matter. This upward pressure is exactly equal to the downward weight and there is consequent equilibrium. Similarly a mass suspended by a cord is in equilibrium under the action of its own weight and the tension of the cord. Every kinetical problem may be reduced to a statical problem by introducing into the material system forces whose effects will balance the various accelerations to which the different parts of the system are subject. This, stated mathematically, is d'Alembert's famous principle, and is a direct consequence of Newton's third law of motion. Taken in connection with the principle of work done, otherwise known as the principle of virtual velocities, it forms the complete analytical expression for all problems, kinetical or statical, bearing on natural phenomena. The problems with which statics deal are evidently particular cases of more general kinetical problems. Strictly, then, kinetics includes statics; but it has always been found convenient to discuss them separately, taking statics first as being the simpler though logically it depends on the former. Dealing thus with equilibrium, it is independent of the consideration of mass except indirectly in so far as weight is involved.

Stationers' Hall, the hall of the "Master and Keepers or Wardens and Commonalty of the Mystery or Art of the Stationers of the City of London." The Company was incorporated in 1557, and had till the passing of the Copyright Act in 1842 an absolute monopoly, as all printers were obliged to serve an apprenticeship to a member of the Company, and every publication, from a Bible to a ballad, was required to be "Entered at Stationers' Hall." This registration is no longer compulsory, but the practice of registering is still useful in making good claims of copyright. The series of registers of books entered for publication, commencing in 1554, is of enormous value in the history of English literature. A transcript of these from 1554 to 1640 was published by Professor Arber in five volumes. See COPYRIGHT.

Stationery, a general term for paper, pens, and ink, and all the materials connected with writing. These articles were formerly vended by a merchant now called a bookseller, but then a stationer, because he carried on his business in a stall or station.

Stationery Office, in London, a sub-department of the Treasury established in 1786, the medium through which all offices at home and abroad in connection with the government are supplied with stationery, and through which all contracts for the printing of parliamentary papers and reports are made. There is a branch establishment at Dublin. The stationery office is presided over by a controller. On account of the magnitude of its transactions a select committee of the House of Commons in 1873 recommended that on the next vacancy a controller with a "technical knowledge of stationery and printing" should be appointed, but on the resignation of W. R. Greg in 1877 Lord Beaconsfield found the recommendation "utterly impracticable," as no gentleman engaged in a successful business could be secured to abandon it for the post. There are permanent experts in every branch of the office, including two examiners and two assistant examiners of printing and printing accounts, one examiner and one assistant examiner of paper as material, and an examiner and two assistant examiners of binding.

Stations, a name applied in the Roman Catholic Church to certain places reputed of special sanctity, which are appointed to be visited as places of prayer. The name is particularly applied in this sense to certain churches in the city of Rome, which from an early period have been appointed as churches which the faithful are particularly invited to visit on stated days. The names of these churches are found on the several days in the Roman missal prefixed to the liturgy peculiar to the day. The word, however, is employed in a still more remarkable manner in reference to a very popular and widely-received devotional practice of the Roman Catholic Church, known as that of "The Stations of the Cross." This devotion prevails in all Catholic countries; and the traveler often recognizes it even at a distance by the emblems which are employed in directing its observance — the lofty "Calvary" crowning some distant eminence, with a series of fresco pictures or bas reliefs arranged at intervals along the line of approach. But the same series of images or pictures is ranged round most Roman Catholic churches, usually starting from one side of the high altar and ending at the other. These representations, the subjects of which are supplied by scenes from the several stages of the Passion of our Lord, are called Stations of the Cross, and the whole series is popularly known as the *Via Calvarii,* or Way of Calvary. The origin of this devotional exercise, like that of local pilgrimages, is traceable to the difficulty of access to the Holy Places of Palestine consequent on the Moslem occupation of Jerusalem and the Holy Land; these representations being designed to serve as some analogous incentive to the piety and faith of the Christian worshiper of our Lord in His Passion. The number of the so-called "stations" is properly 14, although in some places 15, and in others, as Vienna, only 11; but, whatever may be their number, the subject of all is a sort of pictorial narrative of the Passion. The devotional exercise itself is performed by kneeling at the several stations in succession, and reciting certain prayers at each. Forms of prayer are prescribed to those who can read. The poor and ignorant recite the Lord's Prayer and Hail, Mary! all being directed to fix their thoughts in grateful memory upon "the sufferings which each representation describes our Lord as having undergone in atonement for the sins of mankind." Many "indulgences" are granted to those who, having duly repented of their sins, shall piously perform this exercise. One Anglican Church at least, that of Frome in Somerset, has sculptured Stations of the Cross.

Statistics, a collection of facts, arranged and classified, respecting the condition of a people in a state or community, or of a class of people, their health, longevity, domestic economy, their social, moral, intellectual, physical and economical condition, resources, etc., especially those facts which can be stated in numbers, or tables of numbers, or in any tabular and classified arrangement. Also, that department of political science which classifies, arranges, and discusses statistical facts. The Italians were the first to recognize the importance of statistics. The earliest English work on the subject was Graunt's "Observations on the Bills

Statistics

of Mortality," published in 1661. The first International Statistical Congress was held at Brussels in 1853; several others have since taken place. In every civilized country the science of statistics now forms the basis of most inquiries regarding the condition of the people, and no important legislation is attempted without reference, direct or indirect, to the facts which it tabulates.

Gottfried Achenwall, who was born in 1719 and died in 1772, and was a professor of philosophy at Göttingen in 1750, is reported to have originated the modern statistical method. Undoubtedly others used it before Professor Achenwall, but it is as well to attribute the first specific use of the method in the modern sense to him as to any other.

The word "statistics" is from the French *statistique*, from the Greek *statos*, meaning fixed or settled, from the stem *sta*, to stand. Hence statistics means a method by which fixed or settled conditions can be determined. According to definition, statistics is first a collection of facts relating to a part or the whole of a country or people, or of facts relating to a class of individuals or interests and different countries, especially those facts which illustrate physical, social, moral, intellectual, political, industrial and economic condition or changes of condition, and which admit of numerical statement and arrangement in tabular or graphic form. Second, it is that department of political science which classifies, arranges and discusses statistical data.

As we understand it, one of the most essential primary objects of statistics is to secure a simple, concrete statement of a mass of facts the essence of which could not otherwise be expressed except by means of long and tedious descriptive language, and even by the use of such language no concrete and clearly defined conclusion could be reached. There is no method of expressing certain things except through the statistical method. This is true when we understand that statistics belongs to the historical or comparative method of study. The German historian, Schlosser, said that history is statistics ever advancing, and statistics is stationary history. Looking beneath the words of Schlosser, one must conclude that he meant that the constant accumulation of statistical data from period to period or from epoch to epoch — that is, statistics ever in motion — creates history, history being made up of the ever-advancing events of life which are shown through statistical methods, but that statistics of one epoch constitutes the permanent history thereof.

So the statistician, in the truest historical and comparative sense, writes history, but he writes it in the most crystallized form which can be adopted. He uses symbols, but with them he unlocks the facts of his own period so that they may be made plain to all students coming after him. He tells the story of our present state in such a way that when the age we live in becomes the past that story shall be found to exist in true and just proportions. The word "statistics," illustrating fixed and settled conditions, indicates the soundness of the German writer's thought and the true spirit in which the statistician should work.

The use of the statistical method in a scientific way is practically modern. In ancient times there were counts of the people, but no scientific use of the results that would warrant the application of the name statistics. These "counts" were largely to ascertain military strength and divisions of geographical sections. David, you will remember, undertook to number the people. This effort on his part caused him a great deal of difficulty, and so far as the history of the world is concerned every man since David's time who has undertaken to number the people has met more or less opposition and had more or less trouble. All through history we read of counts or, as we say now, enumerations, but they were crude in the extreme and cannot be considered as statistical efforts.

Under our modern systems there are three kinds of statistics — I mean by "kinds" methods which involve different systems to secure results. These are, first, statistics secured by the continuous record of official acts, as for instance the returns from the custom houses; those returns relating to imports and exports, immigration and other affairs are the results of a continuous record of events and are reported to a central office, tabulated and classified. School statistics, the returns of births, deaths and marriages — these come under this classification. They belong more clearly to the domain of bookkeeping, although statistical genius is essential in the classification and analysis of the entries.

The second class of statistics is that secured by actual enumeration, like census statistics, where aggregates are essential to the integrity of results. We must know the number of all the people, the total value of products and of capital, the aggregate wages paid in manufactures, and various other data where there would be little or no value unless all were included in the results. This class of statistics demands higher statistical qualifications, both in preparing for the enumeration and in the tabulation, classification and analysis of the results.

The third kind of statistics is that secured through a special investigation of certain representative facts. For instance, if it is desired to learn the cost of producing iron and steel, it is not necessary as in

Statistics

the previous case to secure data for all the establishments engaged in such production. A few representative works offer ample information for determining cost of production. So in endeavoring to ascertain the course of wages and prices it is not essential to secure aggregates or data relating to all prices or to the wages paid to all the people employed.

The practical work of official statistical officers is divided into three parts also — first, the collection of data, which involves the preparation of schedules and instructions; second, the tabulation and the presentation of the results obtained, and third the analysis. No statistical table should ever be used without consulting carefully all textual treatment thereof, the accompanying notes and the analysis.

Facts may be presented in two ways — in tables, comparative and otherwise, and by the graphical method. The latter is popular and very effective in displaying proportions. The difficulty with it is that one cannot in a speech or in an article quote the diagrams, but it has a very important place in scientific statistics. The graphical method is carried to an absurd degree at times, but it nevertheless offers to a certain class of minds the very best method of determining results. In the final reflections upon statistics, however, one is drawn to the figures themselves.

With these preliminary statements the general subject brings us to the question: Is statistics a science or a method? It is not a matter of much consequence whether statistics constitutes a science or is simply a method. English writers on statistics generally consider it a method; continental writers, a science. American students often lean to the continental view. It is true that statistical research can be called a scientific method of determining facts and for studying various phenomena from which laws relating to life, production, distribution, consumption, etc., can be drawn; and the method must be considered scientific, because by it facts can be clearly stated, classified and analyzed, elements which make science in every department.

We speak of the science of botany for one reason because all the facts relating to botany can be classified, and so as to other departments of human knowledge, classification or the lack of it may determine the scientific character of the knowledge. Science demands a classification of facts so rigid that all men will consent to its use and to the conclusions to which it may point.

Notwithstanding statistics is a science or a scientific method, its use is often empirical, deceptive, illusory and dishonest, and because of these things the method itself is often condemned. No one thinks, however, of condemning anæsthetics because the burglar chloroforms his victim, or the elementary features of arithmetic, the means by which all honest accounts are kept, simply because dishonest accounts are made possible by the same means. So many instances of the lying use of honest statistics meet one's observations that it is not remarkable that many make surprising denunciation of statistics; and the assertion that anything can be proved by it, is made to belittle the importance and value of the method.

It is true that one so disposed can by dropping an essential element of a table show the exact reverse of the truth, just as the foolish man said he could prove by the Bible itself there was no God, referring to the statement "there is no God," leaving out part of the whole statement, which is "The fool hath said in his heart, there is no God." So writers and speakers who have a particular economic theory to sustain will drop out of the statistical presentation of the facts the elements which work against them, using the others as the whole truth. This is seen very often in political speeches. The attempt to make comparison between the percentage of growth of population and the percentage of growth in the expenditures of the Federal government, using no facts relative to the great increase in mechanical production and of wealth, is a vicious use of statistical data. Such showings are the results of the work of the statistical mechanic, the man who constructs statistical tables to order.

Statistics really take the place of observation. The latter is not trustworthy. Enumerations, counts, or records of continuous events are essential to establish accurate knowledge. But statistical science in this direction differs from the exact sciences. A few experiments may establish the fact that water freezes at a certain and the conclusion is that the same results point or that the intermingling of two chemical agents will produce certain results, will always be secured when the same elements are brought in contact; but the phenomena of life conditions and productions may not so easily be ascertained. Statistical work is full of fallacious details. Fallacies are found in the ordinary practice of striking averages. These things add to the disturbing influences resulting from any great enumeration, to perplexing differences among international trade accounts and to miscalculation by individual inquirers.

M. Quetelet, who was the first to use statistics in moral directions, explained the principles which ought to guide us in the matter of averages. He pointed out that an average may indicate two different things. For instance, one measures Nelson's monument 10 times and always with

a slightly different result, and then adds the measurements together and divides the same by 10, the quotient, it is alleged, being an average or mean. So one may accurately measure the Duke of York's Pillar, the Parisian Obelisk and the Column Vendome, add the measurements together, divide the sum by three, and declare the quotient to be the average or mean height of those monuments. Quetelet contended, and very properly, that the results in the two instances are of such different significance as to require two separate names. He would limit the average of mean to cases represented by the first illustration — repeated measurements of one monument — and he would apply the term "arithmetical mean" to cases represented by the second illustration — the measurement of several monuments. The repeated measurings of one monument result in a mean approximation to something actually existing, and this is an excellent definition of an average. The measurings and calculations having reference to a number of monuments result in no knowledge of anything existing; they simply and only indicate a relation among things actually existing.

This difficulty often appears in reporting average wages. Take, for instance, a works employing 20 men at $1 per day, 40 men at $2 per day, and 60 men at $3 per day. The ordinary bookkeeper in a counting room would add these rates together — $1, $2 and $3 — making a total of $6 as the result of the different rates. He would divide 6 by 3, the number of rates, and declare that the average wages in his work was $2 per day. This is an arithmetical mean. The true average is to be obtained by a more elaborate calculation. Twenty men at $1 a day earn $20, 40 men at $2 earn $80 and 60 men at $3 earn $180 per day. Thus, 120 men earn $280 per day. Dividing $280 by 120, we have the true average which is $2.33 instead of $2, the arithmetical mean. So also there are many fallacious calculations drawn from the use of percentage.

Some amusing incidents happen from this method. A writer recently declared that 300 per cent. of the Turks in the city of Washington were criminals. On investigation it appeared that there was one Turk in the city, and he had been convicted three times. So of the young student who took for his thesis the assertion that women in coeducational colleges more frequently married during their college course than men in the same institution. He found a college in which there were 100 men and 2 women. One of the men married one of the women. Hence he sustained his conclusion that 1 per cent. of the men married, while 50 per cent. of the women married. Thorold Rogers' work, "Six Centuries of Work and Wages," contains several instances of this pernicious use of percentages. So also many are constantly using the unscientific conclusions drawn from concomitants — because one thing exists another logically exists contemporaneously.

These illustrations show the necessity of making statistics, the statistical method, thoroughly scientific in all directions, but this scientific conception of statistics does not warrant statisticians in using algebraic formula or in resorting to the calculus to secure results. The results under such methods rarely vary from those secured by the simple common sense method of statistics; on the other hand, they disturb the reader and the common mind cannot understand them. All statistics should be simple, straightforward and clear, and any confusing element which disturbs this clearness is detrimental to the real purpose of the statistical method. While there are very many illustrations going to show the misuse of the method, nevertheless all right-minded men understand that, in economic questions especially, the comparative and historical method of study is the correct one, and the concrete, historical and comparative method is best carried on through the scientific use of statistics.

Stature, the natural height of an animal; bodily height or tallness. (Generally used of human bodies.) The Anthropometric Committee of the British Association, in 1883, reported that of the natives of the British Isles the Scotch stand first in height, averaging 68.71 inches; the Irish stand second, being 67.90 inches; the English come next, 67.36 inches; and the Welsh last, being 66.66 inches; the Polynesian tribes, 69.33 inches; the Patagonians, whose stature has been much exaggerated, 69 inches; the American whites in the United States, 67.67; the Zulus, 67.19, the American negroes, 66.62; the English Jews, 66.57; the French upper classes, 66.14; the Germans, 66.10; the Arabs, 66.08; the Russians, 66.04; the French working classes, 65.24; the Hindus, 64.76; the Chinese, 64.17; the Bushmen of South Africa, the lowest of stature of any known people, 52.78 inches.

Staubbach, a famous Swiss waterfall in Bern; 8 miles S. of Interlachen, and near Lauterbrunnen village. The rocky heights here send down some 200 brooks, the chief being Staubbach which has a sheer descent of 980 feet. In the sunshine it presents the appearance of a transparent lace veil of "rainbow hues," thrown by the breeze into exquisitely ever-varying forms. Long before it reaches the ground it is dissipated in silvery spray, as its name signifies. It is described by Byron, Wordsworth, Goethe, and others.

Staunton, a city and county-seat of Augusta co., Va.; on the Chesapeake and Ohio and the Baltimore and Ohio railroads; 130

miles W. N. W. of Richmond. It is situated in the fertile and beautiful Shenandoah valley. Here are the State Institution for the Deaf, Dumb, and Blind, the Valley Training School for Colored Pupils, the Mary Baldwin Seminary, the Staunton Military Academy, the Staunton Female Seminary, the Wesleyan Female Institute, the Western State Hospital, street railroad and electric light plants, waterworks, National and State banks, and several daily and weekly newspapers. It has manufactories of ice, sash and blinds, cigars, flour, organs, machinery, carriages, etc., and an assessed property valuation exceeding $3,000,000. Pop. (1890) 6,975; (1900) 7,289; (1910) 10,604.

Staunton, a river of Virginia which rises in Montgomery county, and flows E. across Roanoke county, reaching the Blue Ridge, through which it breaks, so forming picturesque scenery and marvels in rapid descent. It is said to fall 1,000 feet in 20 miles. It has devious windings after it emerges from the mountain depths. It unites with the Dan river at Clarksville, Mechlenburg co., to form the Roanoke; length, 200 miles.

Staunton, Howard, an English Shakespearean scholar; was born in 1810, studied at Oxford and early settled down to journalism in London. His victory in 1843 over M. St. Amand made him the champion chess player of his day. To this subject he contributed the following works: "Chess-player's Handbook" (1847); "Chess-player's Companion" (1849); "Chess-tournament" (1851); "Chess Praixis" (1860). His edition of Shakespeare appeared in six volumes (1858–1860), with a number of textual emendations so excellent as to give him rank among the best contemporary critics. Staunton also published in 1866 a careful photolithographic facsimile of the first folio text of Shakespeare. Another useful work was "The Great Schools of England" (1865). He died June 22, 1874.

Staurolite, an orthorhombic mineral occurring only in crystals, mostly in cruciform twins of two kinds, one in which the crystals form approximately right angles with each other, and the other in which they are inclined at an angle of about 60°; hardness, 7 to 7.5; sp. gr. 3.4 to 3.8, after purifying, 3.70 to 3.76; luster, sub-vitreous; color, dark brown to black, sometimes grayish; translucent to opaque; fracture, conchoidal. Composition: Silica, 28.3; alumina, 51.7; protoxide of iron, 15.8; magnesia, 2.5; water, 1.7 = 100, the discrepancies in the analyses being due to impurities. The varieties are: (1) Ordinary; (2) Zinc-staurolite; (3) Manganese-staurolite = Nordmarkite. Occurs in the schists and gneiss, occasionally in crystals of a tessellated structure, when seen in transverse section, resembling chiastolite.

Stavanger, the most important town in the S. W. of Norway; on the S. side of Bukken Fjord; 100 miles S. of Bergen. It has two harbors, entered annually by about 490 vessels of 180,000 tons burden, and derives its importance from its connection with the fisheries of the adjacent coast. The town dates back to the 9th century, but has been frequently destroyed by fire, and is now quite a modern place. The cathedral, a Gothic structure, was founded by an English bishop (Reinald) in the 11th century, but was restored in 1866. Of late years it has become a favorite rendezvous of tourists to Norway. Pop. (1900) 30,613.

Stavesacre, in botany, the *Delphinium staphisagria*, a species of larkspur, a native of the S. of Europe. The seeds have been used in medicine from ancient times; they contain the alkaloids delphinine, delphinoidine, and delphisine, and a considerable quantity of a fixed oil. The seeds are poisonous, causing great depression of the nervous and circulatory systems, with vomiting and purging. They are officinal in the British pharmacopœia, and from them an ointment is made which is used to kill lice, this being its sole therapeutical application at the present time.

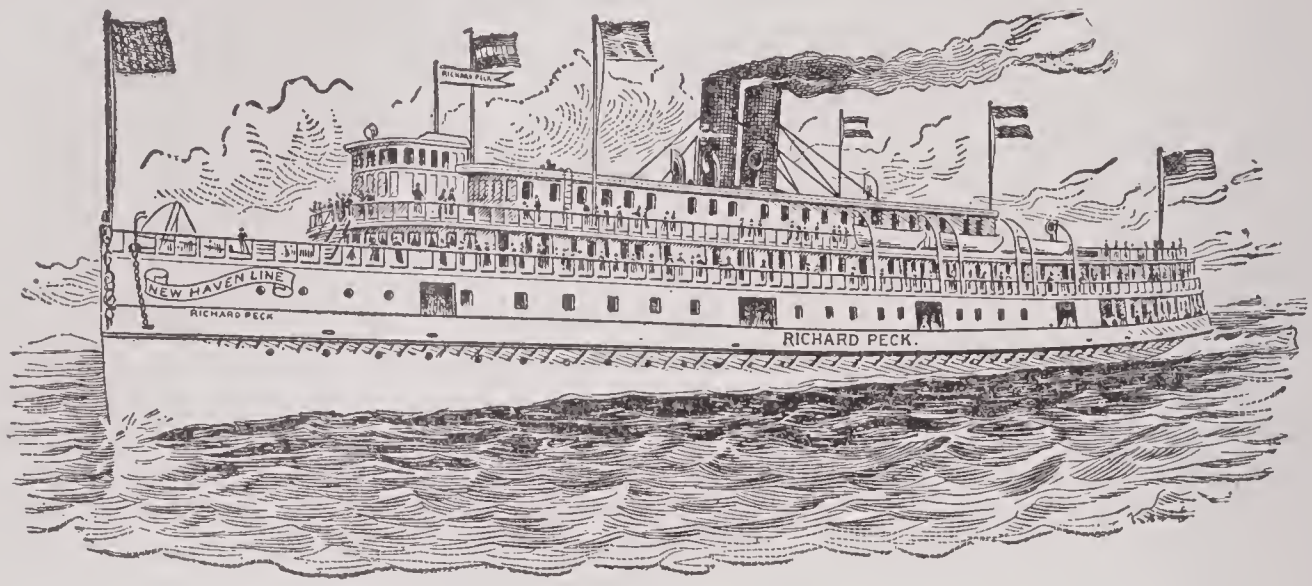
Stay, nautically, a strong rope which stiffens and supports a mast in its erect position, by connecting its head to some part of the hull, or to a part stayed from the hull. The fore-and-aft stays lead forward in the vessel's line amidships; the back stays pass somewhat abaft the shrouds, and are attached to the side of the vessel, at the channels; the breast and standing stays lead from the mastheads down to the gunwale on each side. Spring stays are preventer stays to assist the principal ones. The fore-and-aft stays support the staysails by means of hanks. The stays are named from the masts they support; as, the forestay, foretopmast stay, maintopmast stay, jib and flying-jib stay, bob stay, etc. A jumper stay is a movable stay leading from the head of a mainmast to a pair of eye bolts in the deck close to the after part of the fore rigging. The triatic stay is connected at its ends to the heads of the fore and main masts, and has a thimble spliced to its bight for the suspension of the stay tackle.

Stavropol, a province of Russia in Cis-Caucasia; bordering on the Caspian Sea; as large as Bavaria, but has little more than half of the inhabitants of Berlin; area 20,654 square miles; pop. (1908) 1,088,800. For the most part flat and low, it is watered by the Kuban, Terek, and Kuma. In the N. E. the inhabitants, chiefly nomads, rear large quantities of live-stock and horses, while those in the S. W., where the

soil is more fertile, cultivate wheat, millet, wine, and mulberries. Stavropol, the chief town, on a hill 2,000 feet high, near the Kuban, has a modern appearance, with gardens, boulevards, etc. It has a considerable trade in horses, cattle, sheep, wool, skins, honey, etc. Pop. (1908) 41,590.

(1885). In 1893 he established "Borderland," a periodical devoted to spiritualism. "If Christ Came to Chicago" is another of his publications.

Steadman, Fort, a defensive work on the James river, about 18 miles below Richmond, Va. It was captured by the Confede-



MODERN SOUND PROPELLER.

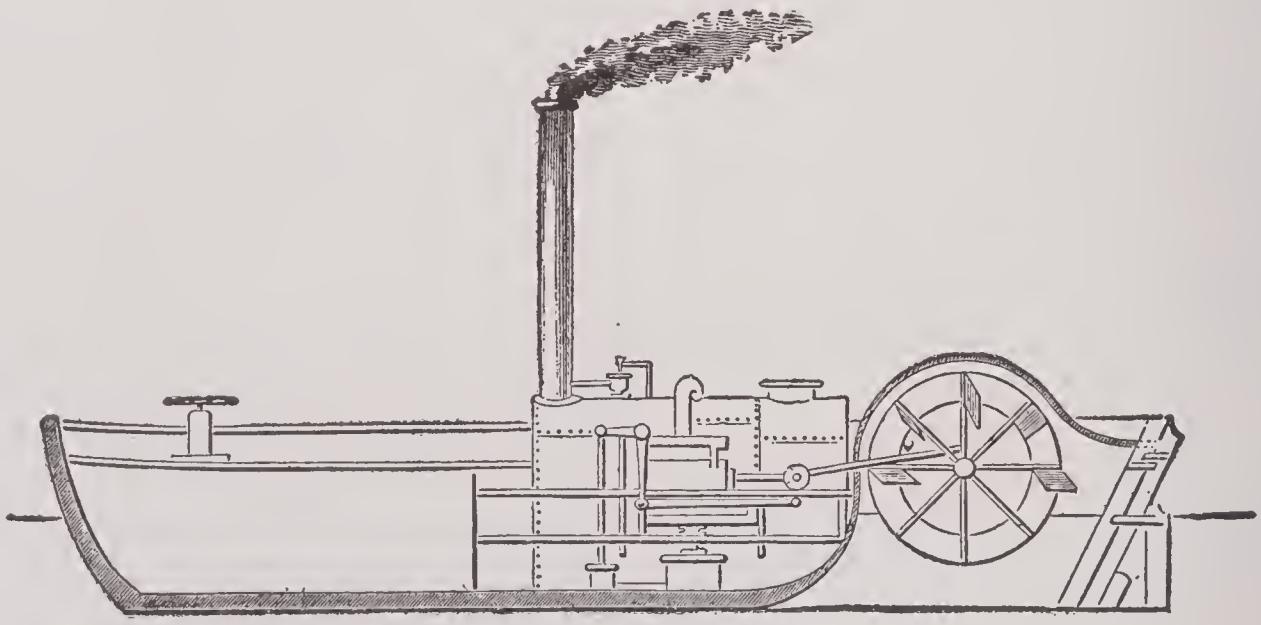
Stchedrin, pseudonym of MIKHAIL EVGRAFOVICH SALTYKOV, a Russian satirical writer; born in the government of Tver, Jan. 15, 1826. He is classed among the best satirical writers of his country. Among his best-known works are: "Satires in Prose" and "Innocent Tales," both published in 1863; "Diary of a Provincial"; "The People of Tashkend"; etc. Some of his works have been translated into English, French, and German. He died in St. Petersburg, May 10, 1889.

Stead, William Thomas, an English journalist; born in Embleton, Northumberland, July 5, 1849. He is widely known as editor of the "Review of Reviews," which he founded in January, 1890. He published "The Maiden Tribute of Modern Babylon"

rates, March 14, 1865, and retaken by the Union troops shortly afterward.

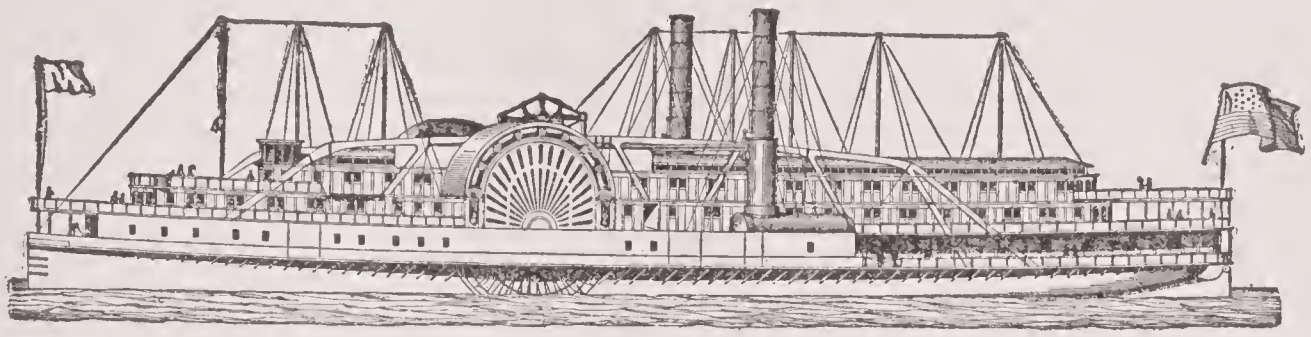
Steatite. See SOAPSTONE.

Steam, in physics, water in its gaseous form. It is a colorless, invisible gas, quite distinct from the visible cloud which issues from a kettle, etc., which is composed of minute drops of water produced by the condensation of the steam as it issues into the colder air. Under ordinary atmospheric pressure, water boils in an open vessel at a temperature of 212°, and the steam always has this temperature, no matter how fast the water is made to boil. The heat which is supplied simply suffices to do the work of converting the liquid water at 212° into gaseous steam at 212°, without raising the temperature of the steam at all. If the



SYMINGTON'S STEAMBOAT, 1801.

temperature of steam at 212° is lowered by only a very small amount, part of the steam is condensed; hence steam at this temperature is termed moist or saturated steam. At high temperatures and pressures, steam behaves like a perfect gas; but at lower pressures and at temperatures near the boiling point of water, its behavior differs markedly from that of perfect gases; and this change of properties has to be taken into account in all calculations connected with the expansion of steam in steam engines. The terms high pressure and low pressure are applied to steam without any sharply defined limit between them. If the steam is superheated by passing it through hot pipes, it is converted into dry steam, which, within certain limits, behaves like a perfect gas. If, instead of allowing the steam to escape freely, the water is boiled in a closed vessel, the steam accumulates, and both pressure and temperature rapidly increase, till the former becomes several times greater than that of the atmosphere. If now the steam is allowed to escape, it rapidly expands, and if it escapes into the cylinder of a steam engine the expansion can be utilized and converted into work. As the steam expands, its pressure of course becomes less and less till it is not greater than that of the atmosphere; and at the same time its temperature is reduced, the reduction depending on the rapidity with which expansion takes place. The economic uses of steam are extremely numerous. The most important is that of an agent for the production of mechanical force on railways, in steamboats, and in manufactories. It is also largely employed in warming buildings, in heating baths, in brewing, in distilling, and for cooking purposes.



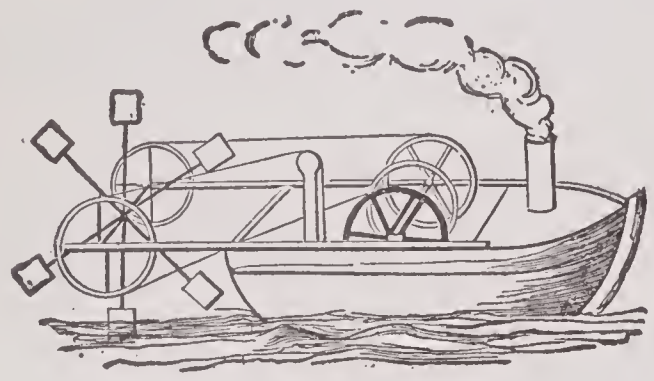
AMERICAN RIVER STEAMBOAT.

A STEAMBOAT OF 1812.

Steamboat, a boat or vessel propelled by steam acting either on paddles or on a screw. The term especially belongs to steam river craft; ocean-going craft being called steamers, steamships, etc. The first steamboat was built by Denis Papin, who navigated it safely down the Fulda as long ago as 1707. Unfortunately this pioneer craft was destroyed by jealous sailors, and even the very memory of it was lost for three-quarters of a century. In 1775 Perrier, another Frenchman, built an experimental steam vessel at Paris. Eight years later, in 1783, Jouffroy took up the idea that had been evolved by Papin and Perrier and built a steamboat which did good service for some time on the Saone.

The first American to attempt to apply steam to navigation was John Fitch, a Connecticut mechanic, who made his initial experiments in the year 1785. To what extent Fitch was indebted to the three illustrious French inventors named above we are not informed, but that his models were original there is not the least doubt. In the first he employed a large pipe kettle for generating the steam, the motive power being side paddles working after the fashion of oars on a common rowboat. In the second Fitch craft the same mode of propulsion was adopted with the exception that the paddles were made to imitate a revolving wheel and were fixed to the stern — clearly foreshadowing the present sternwheeler.

This last mentioned boat was the first American steam vessel that can be pronounced a success. It made its first trip



A STEAMBOAT OF 1736.

to Burlington in July, 1788. But, after all, it was not till after the opening of the 19th century that steam navigation started into actual life. In 1801 Symington designed a boat for towing, which attained a speed of 3½ miles an hour. In 1807 Robert Fulton, an American, in conjunction with one Robert R. Livingston, built the "Clermont" and established a regular packet service between New York and Albany.

The success of this undertaking was so satisfactory that four new boats were built before the end of 1811, at least two of them being designed for service in other rivers. See SHIP.

Steamboat Rollers, rollers armed with steel teeth, and revolving on parallel axes toward each other, by which coal is broken at the mines. The coal falls on to an inclined screen known as the steamboat screen.

Steamboat Screen, an inclined barrel screen which receives the coal from the steamboat rollers, and sorts it.

Steam Dredging. See DREDGING.

Steam Engine. Steam engines in their infancy were known as "fire" (*i. e.*, heat) engines; and in point of fact the older term is the more correct, because the water or steam is only used as a convenient medium through which the form of energy which we call heat is made to perform the required mechanical operations. In modern engines sufficient heat is added to the steam to raise it to a very high pressure, and the excess of this pressure over the pressure opposed to it (either atmospheric pressure or the still lower pressure in a condenser) is both the cause and measure of the work done by the engine. In earlier machines, however, the steam was raised only to atmospheric pressure, and admitted into the engine only to be at once condensed by a jet of cold water. The excess of the atmospheric pressure above the pressure in the partial vacuum caused by the condensation was then the direct cause of work. Engines of this kind were called atmospheric engines. The invention of steam as a moving power is claimed by various nations; but the first extensive employment of it, and most of the improvements made on the steam engine, the world indisputably owes to Great Britain and the United States.

Among the first notices we have in England of the idea of employing steam as a propelling force is in "The Art of Gunnery" (1647), by Nat. Nye, mathematician, in which he proposes to "charge a piece of ordnance without gunpowder," by putting water instead of powder, ramming down an air-tight plug of wood, and then the shot, and applying a fire to the breach "till it burst out suddenly." But the first successful effort was that of the Marquis of Worcester. In his "Century of Inventions," the manuscript of which dates from 1655, he describes a steam apparatus by which he raised a column of water to the height of 40 feet. This, under the name of "Fire waterwork," appears actually to have been at work at Vauxhall in 1656. Sir Samuel Morland in 1683 submitted to Louis XIV. a project for raising water by means of steam, accompanying it with ingenious calculations and tables. The first patent for the application of steam power to various kinds of machines was taken out in 1698 by Captain Savery. In 1699 he exhibited before the Royal Society a working model of his invention. His engines were the first used to any extent in industrial operations; they seem to have been employed for some years in the drainage of mines in Cornwall and Devonshire. The essential improvement in them over the older ones was the use of a boiler separate from the vessel in which the steam did its work; one vessel in all former engines had served both purposes. He made use of the condensation of steam in a close vessel to produce a vacuum, and thus raise the water to a certain height, after which the elasticity of steam pressing on its surface was made to raise it still further in a second vessel.

In all the attempts at pumping engines hitherto made, including Savery's, the steam acted directly on the water to be moved

Steam Engine

without any intervening part. To Denis Papin, a Freneh physicist, is due the idea of the piston. It was first used by him in a model constructed in 1690, where the cylinder was still made to do duty also as a boiler; but in an improved steam pump invented about 1700 he used it as a diaphragm floating on the top of the water in a separate vessel, or cylinder, and the steam, by pressing on the top of it, forced the water out of the cylinder at the other end.

The next great step in advanee was made about 1705 in the "atmospheric" engine, conjointly invented by Newcomen, Cawley, and Savery. This machine held its own for nearly 70 years, and was very largely applied to mines. In it the previous inventions of the separate boiler and of the cylinder with its movable steam-tight piston are utilized, though in a new form. The "beam," which has never since been used in pumping engines, was used for the first time, and for the first time also the condensation of the steam was made in an instantaneous process, instead of a slow and gradual one. Newcomen's engine was chiefly used, like all former steam engines, in raising water. To one end of a beam moving on an axis was attached the rod of the pump to be worked; to the other the rod of a piston moving in a cylinder below. The cylinder was placed over a boiler, and was connected with it by a pipe, provided with a stopcock to cut off or admit the steam. Suppose the pump rod depressed, and the piston raised to the top of the cylinder — which was effected by weights suspended at the pump end of the beam — the steam cock was then turned to cut off the steam, and a dash of cold water was thrown into the cylinder by turning a cock on a water pipe connected with a cistern. This condensed the steam in the cylinder, and caused a vacuum below the piston, which was then forced down by the pressure of the atmosphere, bringing with it the end of the beam to which it was attached, and raised the other along with the pump rod. The cock was then turned to admit fresh steam below the piston, which was raised by the counterpoise; and thus the motion began anew. The opening and shutting of the cocks was at first performed by an attendant, but subsequently a boy named Humphrey Potter (to save, it is said, the trouble of personal superintendence) devised a system of strings and levers by which the engine was made to work its own valves. In 1717 Henry Beighton invented a simpler and more scientific system of "hand gear," which rendered the engine completely self-acting. During the latter part of the time that elapsed before Watt's discoveries changed everything Smeaton brought Newcomen's engine to a very high degree of perfection. As the result of study and experiment he made many improvements in it, in the form of the boiler, the proportions of the cylinder, etc. It was he, too, who invented the eataract, a very ingenious self-acting valve arrangement, which is still used in Cornish engines. In 1725 Leupold invented an engine in which steam of a higher pressure than that of the atmosphere was employed in the cylinder, but his engine possessed defects that prevented its practical use.

The next essential improvements on the steam engine were those of Watt, which began a new era in the history of steam power. The first and most important improvement made by Watt was the separate condenser, patented in 1769. He had observed that the jet of cold water thrown into the cylinder to condense the steam necessarily reduced the temperature of the cylinder so much that a great deal of the steam flowing in at each upward stroke of the piston was condensed before the cylinder got back the heat abstracted from it by the spurt of cold water used for condensing the steam in the cylinder. The loss of steam arising from this was so great that only about one-fourth of what was admitted into the cylinder was actually available as the motive power. Watt therefore provided a separate vessel in which to condense the steam, and which could be kept constantly in a state of vacuum without the loss which arose when the cylinder itself was used as a condenser. This device, which now looks simple enough, was the greatest of Watt's inventions, and forms the foundation of his fame. His genius was such that in a few years he changed the steam engine from a clumsy, wasteful, almost impracticable machine into a machine practically the same as that which we now have. The principal improvements since his time have been either in matters relating to the boiler; in details of construction consequent on our increased facilities, improving machinery, and greater knowledge of the strength of materials; in the enlarged application of his principle of expansive working; or in the application of the steam engine to the propulsion of carriages and vessels. His principal inventions were : (1) The condensation of steam in a vessel separate from the cylinder, so as to avoid the cooling of the latter. (2) The use of a pump, called an "air pump," to withdraw the condensed water and mixed steam and air from the condenser. (3) The surrounding of the cylinder with a steam jacket, in order to prevent loss of heat from condensation (these three, with others, were included in the specification of 1769). (4) The use of the steam expansively in the way explained further on in this article (this was invented before 1769, but not published till 1782). (5) The now universally used double-acting engine, and the conversion of the reciprocating motion of the beam into a rotary motion by means

Steam Engine

of a crank (both these were invented before 1778, the engine being patented in 1782, but the crank having before that date been pirated and patented by another). In 1784 Watt also patented and published his parallel motion, throttle valve, governor, and indicator; all four of which are in substance still used.

The common mode of employing steam in an engine is by causing it to press alternately on the two surfaces of a movable diaphragm or piston enclosed in a fixed, steam-tight, cylindrical box. The piston, by means of a rod passing through the end of the box, is made to communicate motion to the rest of the machinery. The steam is first admitted to one end of the cylinder through an opening or "port," and forces the piston along to the other end. The current of steam from the boiler is then allowed to pass into the other end of the cylinder through the opening, and forces the piston back again to its original position, and so on. But it is obvious that while this return motion is going on the steam previously admitted must be allowed some exit, or the piston could not be forced back. The manner of this exit constitutes the difference between the two principal classes of engines, according as the steam is allowed simply to rush out into the atmosphere or is conducted into a separate vessel and there "condensed."

The simplest way in which steam can be used in a cylinder is at the same time the most wasteful. It consists in filling each end of the cylinder alternately full of steam direct from the boiler, and having the full boiler pressure, and thus forcing the piston along in exactly the same way as that in which it would have to be forced were water the fluid used instead of steam. If we imagine the cylinder to have a capacity of seven cubic feet, then, if it be filled entirely with steam from the boiler at 60 pounds absolute pressure, it will contain (about) one pound weight of steam. The total heat in this pound of steam (above 32° F.), as given in the table, is equivalent to 1,171 thermal units in excess of that possessed by a pound of water at 32° F. When the piston has reached the end of its stroke, the steam contained in the cylinder is thus in itself a great storehouse of work, for each of these thermal units is equivalent to 772 "foot pounds" of mechanical energy, so that the total represents about 904,000 foot pounds, of which we shall see later on only about $\frac{1}{20}$ has been utilized during the stroke, leaving $\frac{19}{20}$ untouched. Instead of making any attempt to utilize this huge balance, at the moment when the cylinder is full of steam one opening is put into communication with the boiler, the other opening with the atmosphere, and the steam immediately rushes out of the cylinder, and dissipates its contained energy through the air. Though the steam, when allowed to go into the atmosphere, is immediately reduced to the pressure corresponding to the temperature of the air (which in ordinary cases would be only a fraction of a pound per square inch), still the full pressure of the atmosphere itself will always be acting on the back of the piston during its stroke, and therefore, to find the force with which the piston is being pushed along, we must subtract that pressure from the steam pressure. On the one side of the piston will be the atmosphere with its uniform pressure of nearly 15 pounds per square inch, and on the other side the steam pressure of 60 pounds. The effective pressure thus will be 60–15, or 45 pounds per square inch only.

Let us now consider the somewhat more economical case of an engine in which the steam is first used as described above, but afterward, instead of being allowed to pass into the atmosphere, is conducted through a pipe into a closed vessel and there condensed. Condensation consists in the subtraction from steam of a portion of its sensible heat. This reduction of temperature has a double effect on the steam: (1) the cooling and liquefaction of a part of it; and (2) the reduction of the rest to the pressure corresponding to the reduced temperature. It is not possible to do one of these things without the other. What is commonly called "vacuum" simply means pressure less than the atmospheric pressure; and, in the case of steam engines, a vacuum generally implies a pressure of between two and three pounds per square inch — *i. e.*, from a seventh to a fifth of the ordinary pressure of the air. The most common way of condensing steam is by bringing it into contact either with a jet of cold water, or with surfaces kept continually cool by a current of water. In either case, directly the steam is brought into contact with the water or cooling surface, it transfers to it the larger portion of its sensible heat. During this process the greater part of the steam is liquefied, and the remainder retains only such a pressure as corresponds to its greatly reduced temperature.

The advantages possessed by a condensing over a non-condensing engine will now be obvious. When the piston is being forced from one end of the cylinder to the other by steam pressure, the force on the back of the piston resisting its motion in that direction, instead of being equal to the pressure of the atmosphere, is only the pressure of the steam in the condenser, or about 2 pounds per square inch. The net effective force is therefore 60 – 2 or 58 pounds instead of 60 – 15 or 45 pounds.

We have supposed that our cylinder when full of steam contained just one pound weight at 60 pounds pressure. Let us now find out how much useful work this pound

Steam Engine

of steam has done for us, and we will then show how the same weight may be made to do a great deal more by utilizing more of its great store of heat. Let us suppose that the area of the cylinder is 2 square feet, while its length (the stroke of the piston) is 3½ feet. It will thus have a capacity of 7 cubic feet, as before assumed. In the first case described we should have a pressure of 45 pounds per square inch exerted on an area of 288 square inches through a distance of 3½ feet. This is equal to 45,360 foot pounds of work. In the second case we have a pressure of 58 pounds per square inch on the same area and through the same distance. This is equal to 58,464 foot pounds of work, or about $\frac{1}{15}$ of the total heat supplied by the fuel. (For simplicity's sake we have here assumed that the water in the boiler has to be raised from 32° to 292°, and evaporated at that temperature. If the water were supplied at 212°, then the work done would be about $\frac{1}{13}$ instead of $\frac{1}{15}$ of the total heat.) We may now proceed to examine the way in which the same weight of steam, generated by the consumption of an identical weight of fuel, may be made to perform many times more work by "working expansively."

One of the properties possessed by steam, in common with all other gases, is a tendency to expand indefinitely; its pressure varies nearly inversely as its volume. For simplicity's sake we shall here assume that steam is a perfect gas and follows Boyle's law, the pressure varying exactly inversely as the volume. If then we have a cylinder of the same area as before, but of twice the length, but only intend to admit one pound of steam into it at a time, it will be necessary, when the piston has traveled 3½ feet of its stroke, to shut the entrance valve, so as to prevent more steam entering; this is called "cutting off" the steam. The piston, however, still continues its motion in the same direction as before, propelled by the internal separative energy among the particles of steam. But as it is pressed forward the space occupied by the steam is always increasing, and its pressure always decreasing in proportion, till at length, when the piston has reached the end of its stroke, the steam occupies exactly double its original volume — viz., ·14 cubic feet, and is reduced in pressure to half its original pressure — viz., to · 30 pounds per square inch. We have thus during the first half of the stroke a constant pressure on the piston of 60 pounds per square inch, and during the second half a pressure gradually decreasing from 60 to 30 pounds. The mean pressure during this second half of the stroke will be found on calculation to be almost exactly 40 pounds. Let us now, in the same way as before, see what work we have been able to get out of our pound of steam by expanding it in this way. In the first half of the stroke we have 58,464 foot pounds of work exactly as before, and then we have in addition a mean pressure of 40 — 2, or 38 pounds per square inch, exerted over 288 square inches for a distance of 3½ feet. This equals 38,304 foot pounds, making a total of 96,768 foot pounds of work obtained from the steam which only gave us 58,464 before. The economy of working expansively, however, goes much further than this. If the cylinder had been four times its original length, and the steam had been cut off at the same point as before (which would then be quarter instead of half stroke), we should have obtained from the one pound of steam about 144,000 foot pounds of work. If we had gone still further and expanded the pound of steam into eight times its original volume, we should have obtained about 180,000 foot pounds of work, which is more than three times as much as at first. (In actual working, owing to various causes — such as imperfect action of the valves, radiation from the cylinder, bad vacuum, etc.— the work obtained from the steam is not more than .65 to .75 of that given in this paragraph.) All modern engines are worked more or less on this principle of expansion, and the general tendency seems to be every year to adopt higher initial pressures and (within certain limits) larger ratios of expansion.

A double acting engine is one in which the steam acts on both sides of the piston instead of only on one, as in Newcomen's engine. Watt's engine, though not of the form now generally used, contains all the parts now considered essential. The steam from the boiler passes direct to the valve chest, which is simply a long box attached to the cylinder. In this chest are placed valves which are so regulated as to open communication between the boiler, cylinder, and condenser in such a way that when the top of the cylinder is open to the boiler the bottom communicates with the condenser. When the steam has done its work it passes out through the bent pipe into the condenser, where it is met by a jet of water and condensed, as before explained; an air pump continually draws away the contents of the condenser, and discharges them into a cistern called the hot well. A small force pump draws part of the water from this cistern, and sends it back again to the boiler, there to be reconverted into steam, while the rest of the water is allowed to run to waste. A suction pump supplies water to the large tank round the condenser, and also for the condensing jet. Inside the cylinder are the piston and the piston rod, connecting it with the beam. In Newcomen's engine the rod had only to pull the beam down, and not to push it up; it could, therefore, be connected to it by a chain.

In the double-acting engine the piston rod is required both to pull and to push the beam, so that the chain is no longer admissible. It is obvious that as the head of the rod must move in a straight line, while every point in the beam describes an arc of a circle, the two cannot be rigidly connected. Watt invented the arrangement of rods by which the piston rod head is always guided in a straight line, while the end of the beam is left free to pursue its own course. The end of the beam farthest from the cylinder is connected by a rod called a connecting rod, to the crank, which is firmly fixed on the shaft; and by this means the reciprocating motion of the beam is converted into the rotary motion of the "crank-shaft."

The cylinder and its piston are both made of cast iron. The former is very accurately bored in a special machine, and ought always to be covered outside with non-conducting material to prevent radiation of heat. It is frequently enclosed in another cylinder, and the annular space or "jacket" between them filled with steam from the boiler, principally with the object of preventing liquefaction in the cylinder, which is fatal to economical working. The openings for the entrance and discharge of the steam are both called ports.

The valve or valves which regulate the admission of steam to the cylinder vary very much in construction and design. In ordinary engines one valve, called a slide-valve, does the whole work for each cylinder. The steam enters one end of the cylinder while the steam in the other end is free to rush out under the valve and into the condenser. By the time the piston has reached the same position, going in the opposite direction, the valve is in its bottom position, and the motion of the steam is exactly reversed. The valve opens one port at the same moment as it closes the other. This corresponds to entirely non-expansion working. In order to "cut off" the steam before the end of the stroke the breadth of the ends of the valve must be increased. When it is desired to "cut off" the steam earlier than half-stroke, a separate valve, called an expansion valve, is generally used. The flywheel is a large wheel fixed on the crank shaft and having a very heavy rim. As it revolves this contains, stored up in itself, a great quantity of energy, and so equalizes the motion of the shaft, and by restoring some of the energy enables the engine to pass the "dead-points," or points at which the connecting rod and crank are in a line. The condenser is simply a cast iron box of any convenient shape. The water for condensing the steam is introduced into it in a jet in such a way that its particles mix with the steam at once on entering, and condense it almost instantaneously.

The governor is an ingenious application by Watt of mechanism long used in water mills. Its object is to make the engine to a great extent regulate its own speed, so that it shall neither be pulled up altogether by a sudden increase of load, nor "race" when any part of its load is suddenly removed. It consists essentially of a spindle or upright rod, with a pulley by which it is caused to revolve fixed on it. Two levers are pivoted on a pin near the top of the spindle, and at the lower end of each is fixed a heavy cast iron ball. When the engine is running at its proper speed the balls revolve with the spindle in the position shown; but if that speed be increased the centrifugal force causes them to fly outward, and consequently upward; and conversely if it be decreased they fall downward toward the center. At the upper end of the spindle is a system of levers, by which the raising of the balls tends to close, and their lowering to open, the throttle valve.

This throttle valve is simply a disk of metal placed in the steam pipe near the cylinder, but a great many other types of valves — more expensive but more efficient — are now used for the same purpose. The further this valve is opened the greater the amount of steam admitted to the cylinder, and so the tendency of the engine to alter its speed arising from causes extraneous to itself is just balanced by the alteration made in the amount of steam admitted through the throttle valve. In order that economy as well as regularity of working may be attained, it is necessary that the governor should be so arranged as to control the "cut-off" instead of throttling the steam.

The Cornish engine, so called from the fact that it is principally used in the Cornish mines, resembles Watt's engine in general appearance. Like Newcomen's engine it is used exclusively for pumping and has no rotary motion, and it is virtually single-acting; but, unlike his, the steam pressure and not that of the atmosphere actually does the work. Cornish engines are fairly economical of steam, but are very costly and extremely heavy and unwieldy.

Engines in which the piston rod and connecting rod are directly attached are called direct-acting engines, of which the horizontal engine is the most common type. For all ordinary purposes direct-acting engines are rapidly superseding every other form. They possess the merit of having great simplicity and few working parts, and of all these parts being easily accessible to the engine driver; and at the same time any required degree of economical working can be obtained in them as well as in any other form. They were at first only used as non-condensing or high-pressure engines, but are now as frequently made with a condenser attached.

Steam Engine

Two other forms of direct-acting engines have been much used in their day, but are now being rapidly abandoned except under special circumstances; these are called respectively the oscillating and the trunk engine. In the former, used for marine engines, the crank shaft is above the cylinder, the piston rod head is attached to the crank pin, and the connecting rod is dispensed with by allowing the cylinder to oscillate on large hollow centers called trunnions, and so to adapt itself to the various positions of the crank pin. In the trunk engine the piston rod becomes a hollow cylinder or trunk, large enough to allow the connecting rod to vibrate inside it. The latter is then attached at one end to the crank pin as usual, and at the other to a pin fixed in the piston. Direct-acting engines are now made to run at extremely high speeds, for driving dynamos, etc., direct. For this purpose they are made single-acting only, so that the steam pressure tends always to keep the working surfaces pressed together, and there is none of the shock and noise found in ordinary engines where the direction of pressure is reversed at each stroke. An immense amount of ingenuity has been expended in devising engines in which the rotary motion of the shaft is obtained directly from the piston without the intervention of reciprocating parts. These machines are called rotary engines; they have never come into general use, and most of them have been defective in construction as well as founded on a dynamical misconception.

In locomotive engines it is necessary that the whole machinery should be compressed into the smallest possible bulk, and this necessity is the cause of their principal peculiarities. The engine itself is much the same as an ordinary horizontal engine, and has two cylinders placed side by side near the front of the locomotive. These cylinders are sometimes placed inside the main framing, which runs the whole length of the engine, and sometimes outside it, each plan having certain advantages. At the back of the locomotive is the firebox, the bottom of which is formed by the grate. Fuel is introduced by the door. The firebox is enclosed in a casing, and the space between is filled with water. This space communicates freely with the barrel of the boiler, a long wrought-iron or steel cylinder. From the back of the firebox numerous small tubes traverse the boiler (through the water) to the smoke box, and conduct the products of combustion to the chimney. The steam pipe is led away from near the top of the dome and fitted with a regulator valve. There are a pair of spring safety valves. Both cylinders discharge their steam through the vertical blast pipe, and by this means a sufficient draught is caused, notwithstanding the small height of the chimney. The cylinders are placed in the bottom of the smoke box and partly enclosed in it.

In all marine engines except the very smallest, two cylinders are used, working cranks at right angles to each other, so as to equalize the motion as far as possible, it being almost impossible to use a flywheel of sufficient weight for that purpose on board ship. The form originally known as the steam-hammer engine, or some modification of it, is now almost universally adopted. They are direct acting, but the cylinders are inverted, and placed right above the propeller shaft. Two of the greatest improvements in the modern steam engine — the surface condenser and the compound engine — have been brought to perfection chiefly in connection with marine engines here. In the surface condenser the steam is condensed by contact with the exterior surface of a great number of small tubes, through the interior of which a current of cold sea water is kept constantly flowing. By this means the condensing water and the condensed steam are kept separate, the former being returned to the sea, and the latter only sent into the hot well. The boiler, therefore, is continually fed with distilled water, and the wasteful process of blowing off, to get rid of the unvaporizable matter which would otherwise be deposited in the boiler, is rendered unnecessary.

In compound engines the two cylinders are of unequal size — the larger, called the low-pressure cylinder, having from three to four times the capacity of the smaller or high-pressure cylinder. The steam from the boiler is admitted into the latter in the usual way, and cut off generally at from $\frac{3}{8}$ to $\frac{5}{8}$ of the stroke; and after doing its work there it is conducted to the large cylinder, where its reduced pressure, by acting on an increased area, does as much work as in the other cylinder, and thence to the condenser. This system of engine has several notable advantages — among which are that the driving pressures are more uniform than in ordinary engines; that leakage past the piston becomes of less importance; that for any given large measure of expansion the mechanism of the engine is much more simple than for the same degree of expansion carried out independently in two cylinders; and that the losses due to condensation of steam in the cylinders (which are now known to be among the most serious of all causes of waste) are much reduced.

In modern marine engines, and to some extent also in mill engines, the compound principle is now carried further, and triple expansion engines (which are simply compound engines with three cylinders used consecutively instead of two) are very widely employed, with very economical results. In these engines steam is not uncommonly

used at a pressure as great as 165 pounds per square inch, or six times as much as was usual about 1860. Quadruple engines are also used.

The work done by steam engines is estimated in two ways — as horse power and as duty, and the first expression includes two things — nominal and indicated horse power. Thirty-three thousand foot pounds of work done per minute is called one horse power, this being considered by Watt as the maximum rate at which a strong horse can work. The nominal horse power of an engine has long ceased to be any expression of the actual power it exerts; it is only used as a kind of commercial standard (a very deficient one) for the sale and purchase of engines, and is generally made to depend entirely on the diameter of the cylinder. The indicated horse power is the most useful measure we have of the work done by an engine. It expresses, however, not the work itself, but the rate at which that work is being done in the cylinder. It has to be remembered also that it does not show at all what proportion of that work has to be expended in overcoming the friction of the engine itself. It is ascertained by the use of a little apparatus called an indicator, devised by Watt, and since his time greatly improved. By taking the mean pressure per square inch on the piston throughout the stroke measured from the indicator diagram, and multiplying it by the area of the piston and by the number of feet passed through by it in a minute, we can find the number of foot pounds of work done by the engine per minute; and this divided by 33,000 gives the indicated horse power.

Duty is an expression used only for pumping engines, and differs from horse power in being entirely independent of time — *i. e.*, it is a measure of work done, and not of the rate at which it is done. It is the number of foot pounds of net work resulting from the consumption of a given quantity of coal. At the beginning of the 19th century the maximum duty that had been attained by any Cornish engine was 20,000,000 foot pounds per 100 pounds of coal, but six times that duty has since been occasionally obtained. In these engines it is the actual net work done which is taken into account; the duty would be 20 or 25 per cent. greater if the total load on the steam piston had been considered instead.

For engines whose power can only be measured by the indicator the standard of economy is the number of pounds of steam used per hour per indicated horse power. A first-class non-condensing engine, working with steam of about 100 pounds pressure, uses about 22 pounds of steam per indicated horse power per hour, which has been reduced to as low as 12 pounds by the employment of condensation and many expansions. In any case economy is only to be obtained if the engines are worked at or near their full power, and with the full steam pressure for which they are intended. It is very common to speak of the amount of coal burned per indicated horse power per hour, and this is a very important quantity. It is, however, a measure of the combined economy of a boiler and engine, and not of the economy of an engine alone. A pound of Welsh coal can be made to evaporate 10 to 11 pounds of water under special conditions. In ordinary circumstances and over long periods the evaporation is more like 7½ to 9 pounds of water per pound coal. Inferior fuels, or good fuel badly burned, give lower results. See also STEAM TURBINE.

Steamer, or Race-horse Duck (*Micropterus brachypterus*), a species of marine duck from 35 to 40 inches in length, distinguished by its small, short wings, and the swiftness with which it paddles over the surface of the water. It is found in Patagonia and the Falkland Islands.

Steam Gauge, an instrument attached to a boiler to indicate the pressure of steam. There are many varieties. The oldest and simplest consists of a bent tube partially filled with mercury, one end of which springs from the boiler, so that the steam rising in the tube forces up the mercury in proportion to the amount of pressure. Bourdon's consists of an elliptical copper tube bent into an arc of 540°. One of the extremities communicates with the boiler or reservoir of condensed gas whose pressure is to be measured, and the other carries an index which moves backward or forward on a graduated arc as the curvature of the tube is varied by changes of pressure.

Steam Hammer. See HAMMER.

Steam Pump, a steam engine for driving a pump; also called a pumping-engine. The simplest form of these machines has one steam cylinder and one water cylinder, with a common piston-rod carrying at one end a steam piston and at the other a pump piston or plunger. A second, third, or even fourth cylinder may be added and the expansive action of the steam utilized. Such machines are designated respectively as compound, triple expansion, and quadruple expansion. Steam pumps are particularly used in connection with stationary fire apparatus, in supplying boiler feed, and in moving liquids in manufactories. See PUMP.

Steam Shovel, a power-machine, similar to a dredge, used for excavating earth; called also steam excavator and navvy. It was invented in 1840 by Otis, an American, and came into extensive use in railway construction. In the common form, the ma-

Steam Turbine

chine is mounted on a strong supporting frame equipped with wheels. It consists of a scoop or dipper carried and hoisted by a crane and operated by a thrusting device.

Steam Turbine, a prime mover consisting of a wheel or rotor equipped with vanes or blades and rotated by the impact of expanding steam. The first steam engine of which there is record was a reaction turbine devised by Hero of Alexandria (*q. v.*). This was a hollow spherical vessel mounted on two trunnions, through which steam was supplied. The exhaust escaped from two short pipes placed at right angles to the axis of rotation on opposite sides of the sphere and with openings tangential to it. Rotation was effected by the reaction of the escaping steam. About 1629 the Italian Giovanni Branca invented the first impulse steam turbine, consisting of a paddle-wheel driven by a jet of steam. No further development was made until toward the close of the nineteenth century, when several independent series of experiments were conducted. In 1884 Charles A. Parsons, an Englishman, gave a successful demonstration of the first practicable steam turbine, and in 1889 G. de Laval, of Sweden, obtained a patent. As these two types of turbine represent the two principles employed in construction (*i. e.*, the axial and radial, respectively), they may be briefly described.

The Parsons turbine is horizontal—that is, the wheel or rotor is in a position horizontal to its bearings, as is, for example, the propeller-shaft in a steamship. The rotor is a shaft or drum revolving within a concentric case. Upon the shaft are circumferential rows of vanes or blades, and upon the interior of the case are similar rows of fixed vanes or blades. The vanes on the shaft nearly touch the case, and the fixed vanes on the case nearly touch the shaft. The steam traverses the annular space between shaft and case. In order to provide for the increasing expansion of the steam, the vanes on the shaft are divided into a series of turbines of gradually increasing size. Thus, at each stage of the series, a slight reduction of pressure is effected. This permits, without any great sacrifice of efficiency, a speed of rotation slow enough so that the turbine may be coupled directly to dynamos or to the propellers of vessels.

In the De Laval turbine, which is simply an improved form of Branca's, the steam is directed from stationary and divergent nozzles upon a ring of vanes or buckets attached to the periphery of a revolving wheel. The number of nozzles used depends on the steam-pressure and the power demanded. When the turbine is employed for reduced loads, some of the nozzles may be closed by valves. The steam expands entirely within the nozzles. This turbine is of very high speed, and working velocities are obtained by special gearing. The principle involved has been very successfully applied to cream separators. The Curtis is a vertical turbine combining the principles of the Parsons and the De Laval, and there are a number of other varieties, such as the Dow, Rateau, Riedler-Stumpf, Schulz, Seger, and Zoelly.

Many advantages are claimed for the turbine over the reciprocating engine. The more important may here be briefly summarized. 1. Turbines are more economically installed, as they can be sent from the manufacturer with the main parts in place and do not require elaborate foundations. 2. Turbines are more economical of space, a matter of importance both in manufactories and aboard ship. 3. Turbines are more economical in operation since they are much simpler in construction and show little wear, and the cost of repairs is therefore greatly reduced. No internal lubrication is required, and the exhaust may be condensed into oil-free water boiler feed. 4. Turbines have little vibration.

Turbines find their most serviceable applications in driving electric generators and in supplying motive power for steamships. In connection with generators they have been used for lighting, operating railways, and furnishing power for machine shops, paper mills, textile mills, etc. The marine turbine has also been employed with success. It was installed on the "Dreadnought" (completed in 1906), of the British navy, and although designed to give 23,000 horse-power with a speed of 21 knots, at its trial developed 28,000 horse-power with a mean speed of 21½ knots and an occasional speed of 22¼ knots. This result encouraged further experiments by naval powers. Steamship lines had previously brought turbines beyond the experimental stage, and in the "Lusitania" (1907) and "Mauretania" (1907), of the Cunard service, it was believed that a decided advance step had been taken. The turbine equipment of the "Mauretania," which may be taken as an example, consists of four shafts with one propeller each; the two inner shafts being driven by two low-pressure turbines and the two outer shafts by two high-pressure turbines. Turbines for driving the ship astern are situated at the after end of the low-pressure turbines and on the same shafts. The casing of the low-pressure shaft has an internal diameter of 16 feet 6 inches; and the shaft itself is 33 inches in diameter and about 100 feet long. The casing of the high-pressure shaft has an internal diameter of 10 feet, and the shaft is 27 inches in diameter and about 25 feet long. Steam is supplied by 25 cylindrical boilers. The trial speed of the "Mauretania" was 27⅓ knots, and in November, 1907, the ship made a day's run of 624 knots (or 25.83 miles per hour). Owing to the fact that the high-pressure steam pipes

are practically on the floor, the marine turbine requires that special attention be given to the ventilation of stokeholds and engine-room.

Steam Whistle, a sounding device connected with the boiler of a steam engine, either stationary, locomotive, or marine, for the purpose of announcing the hours of work, signaling, etc. In the ordinary locomotive steam whistle the foot is bolted onto the fire box, has an opening for the admission of steam, and is provided with a cock, by turning which steam is permitted to rush into the hollow piece, which is provided with holes around its lower and narrower portion, through which the steam rushes into the cavity of the cup, and, passing out through the narrow annular opening, impinges against the rim of the bell, causing a shrill, piercing sound. Holes in the top of the bell permit the escape of the steam upwardly and increase the volume of sound. The quality of the tone depends on the width of the annular opening, the depth of the bell, and the distance between it and the cup. The calliope is a series of such whistles tuned to a scale and operated by keys.

Steam Winch, a form of hoisting apparatus in which rotary motion is imparted to the winding axle from the piston rod of a steam engine, directly or intermediately, through bevel gearing. The former is more rapid; the latter affords greater power. Specially used for loading and unloading ships.

Stearamide, $(S_{18}H_{35}O)H_2N$; obtained by heating ethylic stearate with alcoholic ammonia for several days in a sealed tube at a temperature of 120°. It is purified by recrystallization from alcohol and washing with ether. After melting it solidifies at 107.5.

Stearanilide, $(C_{18}H_{35}O)(C_6H_5)HN$; phenyl-stearamide; formed when excess of aniline is distilled over stearic acid heated to 230° in an oil bath. The product is purified by repeated crystallization from alcohol, when it is obtained as white shining needles, melting at 93.6°, and solidifying to a mass of radiated crystals.

Stearates, compounds of stearic acid with the alkalies and metals. They have the consistence of hard soaps and plasters, and are mostly insoluble in water. Stearate of potassium, $C_{18}H_{35}KO_2$, separates on cooling from a solution of one part stearic acid and one part potassic hydrate in 10 parts of water. It forms shining delicate needles, having a faint alkaline taste, and dissolves in 6.7 parts boiling alcohol and 25 parts boiling water. Acid stearate of potassium, $C_{18}H_{35}KO_2 \cdot C_{18}H_{36}O_2$, obtained by decomposing the neutral salt with 1,000 parts of water. When dried and dissolved in alcohol it separates in silvery scales inodorous and soft to the touch. It dissolves in four parts of boiling absolute alcohol.

Stearic Acid, in chemistry, $C_{18}H_{35}O \cdot OH$, an acid discovered by Chevreul, and found as a frequent constituent of fats derived from the animal and vegetable kingdoms, and especially abundant as a tristearin in beef and mutton suet. It may be obtained by saponifying the fat with soda lye, decomposing with sulphuric acid, dissolving the fatty acids in alcohol, and repeatedly crystallizing, the first portions of the fatty acid only being taken. When pure it crystallizes from alcohol in nacreous laminæ or needles, is tasteless and inodorous, and has a distinct acid reaction. Its specific gravity is nearly that of water, it melts at 69–69.2°, distills in a vacuum without alteration, and is sparingly soluble in alcohol, more so in ether and benzene.

Stearic Ethers, compounds of stearic acid with the alcohol radicals. Methylic stearate, $C_{18}H_{35}(CH_3)O_2$, is formed by heating stearic acid with methylic alcohol in a sealed tube. It is a neutral crystalline mass insoluble in water, and melting at 38°. Ethylic stearate, stearic ether, $C_{18}H_{35}(C_2H_5)O_2$. Obtained by passing hydrochloric acid gas into an alcoholic solution of stearic acid. It is a crystalline mass, resembling white wax, melts at 33.7, and is tasteless and inodorous.

Stearidic Acid, $C_{18}H_{34}O_2$; obtained by heating bromo-stearate of silver with water. It is an amorphous mass with a peculiar faint odor, is soluble in alcohol, melts at 35°, and distills unchanged. With the alkalies it forms soaps.

Stearine, or **Stearin,** in chemistry, $C_{57}H_{110}O_6$, the chief ingredient of suet and tallow, or the harder ingredient of animal fats, oleine being the softer one. It is obtained from mutton suet by repeated solution in ether and crystallization. It may also be obtained by pressing tallow between hot plates, and afterward dissolving in not ether, which on cooling deposits the stearine. It has a pearly luster, is soft to the touch, but not greasy. It is insoluble in water, but soluble in hot alcohol and ether. When treated with superheated steam it is separated into stearic acid and glycerin, and when boiled with alkalies is saponified, that is, the stearic acid combines with the alkali, forming soap, and glycerin is separated. When melted it resembles wax.

Stearns, Frank Preston, an American art critic; born in Medford, Mass., Jan. 4, 1846. He wrote: "The Real and Ideal in Literature"; "Life of Tintoretto"; "The Midsummer of Italian Art"; "Sketches from Concord to Appledore"; "Modern English Prose"; and "Summer Travel in Europe"; "Life of Bismarck"; etc.

Stearns, James Schermerhorn, an American lawyer; born in Waterbury, N. Y., about 1836; was admitted to the bar in 1857; became noted for his benevolence, and devoted much of his time and money to charitable work. He founded and supported missions in Newton and Dover, N. J., and contributed largely to the Market Street Mission in Morristown, N. J. He died in Morristown, N. J., Jan. 25, 1902.

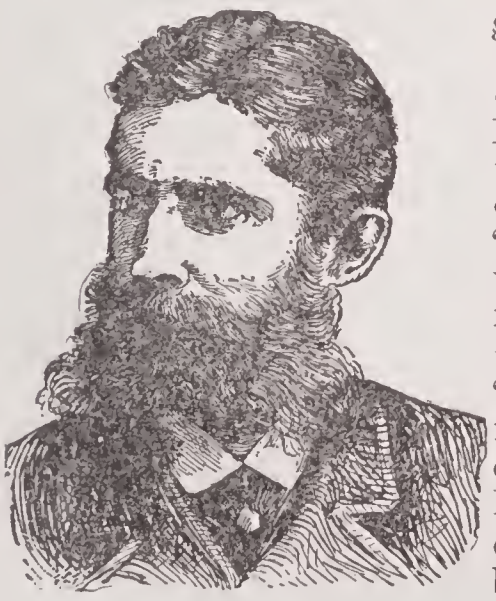
Steatite. See SOAPSTONE: TALC.

Stearoglucose, glucic stearate; formula, $C_6H_5 \begin{cases} (C_{18}H_{35}O_2)_2 \\ (HO)_3 \end{cases}$ formed when stearin and anhydrous glucose are heated to 120° for 50 or 60 hours. It is obtained in microscopic granules, or as a white fusible mass, is neutral, and assumes with oil of vitriol a reddish color, changing to violet and black.

Stearone, or **Stearene,** $C_{18}H_{35}O \cdot C_{17}H_{35}$; the ketone of stearic acid, produced by the dry distillation of calcic or plumbic stearate, the resulting product being finely pulverized, and then several times washed with ether. It forms delicate pearly laminæ, slightly soluble in boiling alcohol, nearly insoluble in cold ether, and melts at 87.8°.

Stedingers, a politico-religious sect which arose early in the 13th century in the district of Steding, now called Oldenburg. They appear to have been a section of the Albigenses, and a crusade was organized against them by Gerhard, Archbishop of Bremen.

Stedman, Edmund Clarence, an American poet and banker; born in Hartford, Conn., Oct. 8, 1833; was a student at Yale, but did not graduate. In 1852 he became editor of the Norwich "Tribune," and later of the Winsted "Herald." He was a war correspondent of the New York "World" during the American Civil War. In 1884 he became a stock broker in New York city. He wrote: "Poems Lyric and Idyllic" (1860); "Alice of Monmouth, and Other Poems" (1864); "The Blameless Prince, and Other Poems" (1869); "Hawthorne, and Other Poems" (1877); "Lyrics and Idylls" (1879); "Poems Now First Collected" (1897); and poems for special occasions, the "Dartmouth Ode"; "Gettysburg"; etc. The best known of his critical works are: "Victorian Poets" (1875; revised and supplemented, 1887 and 1891); "Edgar Allan Poe" (1880); and "Poets of America" (1885). He edited in collaboration with Ellen M. Hutchinson "A Library of American Literature" (1888–1890). He died Jan. 18, 1908.



EDMUND C. STEDMAN.

Steel. Recent improvements in the metallurgical treatment of iron have so broken down all dividing lines between malleable iron, cast iron, and steel that there is now much difficulty in defining and limiting any of these forms. Steel may in a general way be defined as a variety or condition of iron capable of being melted and cast, hammered and welded, and of being tempered, or hardened and softened. It is thus in its properties intermediate between malleable and cast iron, and in its composition it also occupies a middle place between these two varieties. The proportion of carbon contained in the metal is the chief element in determining its character, cast iron containing generally from 2.5 to about 5 per cent. of carbon, steel having from .05 to 1.80, and the proportion in malleable iron varying from .016 up to about .34; but there are other circumstances which also go to determine the nature and quality of any of the kinds.

The methods by which steel of various qualities are now produced are numerous, but they may all be included under these heads: (1) The partial decarbonization of cast iron; (2) the addition of carbon to malleable iron; and (3) the complete decarbonization of pig iron, and the addition of the necessary carbon by means of pig iron or other kinds rich in carbon to the molten mass. By the first of these processes what are known as natural steel and puddled steel are produced. Natural steel is made from pure varieties of pig iron (white or fusible gray pig, from spathic or magnetic ores) by melting it with charcoal on the hearth of a refining furnace, as in the corresponding operation in the manufacture of malleable iron; the operation being so controlled that it can be stopped when the desired amount of decarbonization has been effected. Natural steel, known also as Styrian or Corinthian steel, from having been largely made in these provinces, was formerly in great request on the Continent for tool making. Puddled steel is a similar but less pure product, made also direct from cast iron on the bed of a puddling furnace, the puddling being stopped before the complete oxidation of the carbon. In this process, also, the only difference from the analogous stage in malleable iron manufacture consists in stopping the operation at an earlier stage. The steel of the famous works of Krupp at Essen is made by this process, and it is largely used for

machine castings, railway wheel tires, and other large works.

The kinds of steel produced by the imparting of carbon to malleable iron are known as cementation steel, and the varieties included under this head embrace the most valuable classes of steel. The production of cementation steel depends on the fact that when malleable iron is heated to a high temperature in contact with carbonaceous matter without access of air, it absorbs carbon, and thus becomes converted into steel. Bar iron of the highest quality only is used for making cementation steel, and the bars are embedded in powdered charcoal and packed in a chamber heated by a furnace. The temperature is gradually raised, and kept uniformly at a full red heat (about 2,000° F.) for about a week, at the end of which time the furnace is allowed to cool slowly down, which requires another fortnight. When the bars are unpacked they exhibit a surface covered with small blisters, whence the steel in this condition is called "blister steel." To make it homogeneous, the bars are faggoted, heated to welding heat, and hammered or rolled, the resulting material being "shear steel." When, instead of being hammered, the blister steel is melted in crucibles and cast in molds, it forms "crucible cast steel," the purest of all varieties of steel, and that which is principally used for files, cutlery, and fine tools generally.

Siemens-Martin steel is produced by what may be regarded as a modification of the cementation process, since in it malleable iron is carburetted by means of pig iron or other compound rich in carbon. There is, however, in the process little in common with the cementation process, and the product is of a different class. Siemens-Martin steel is manufactured by the agency of the Siemens regenerative gas furnace, and it is entirely owing to its employment that the method of steel making which was introduced by Martin and had been proposed by others has been rendered practicable. On the hearth of an open furnace heated by gas on the regenerative system a quantity of pig iron is melted, and to that scrap iron, old rails, etc., heated to redness, are gradually added. When by the examination of test pieces it is found that the quantity of carbon is sufficiently reduced, by the addition of malleable iron, for the kind of steel required, the charge is run off. The Siemens-Martin process is also conducted in a manner modified as follows: The pig iron and malleable scrap are melted together, an operation which occupies from two and one-half to three hours, and thereupon a quantity of iron ore (hæmatite) is added to the furnace, which in giving off its combined oxygen decarbonizes the entire charge. When the decarbonization is found to be complete, from 8 to 10 per cent. of spiegeleisen (or about 2 per cent. of ferro-manganese), previously raised to a red heat, is thrown into the furnace. After about 1 minutes this will be thoroughly dissolved, the carbon disseminated through the mass, and the charge ready for being tapped off. Steel so made is now largely used for rails, wagon wheels and axles, and it is being introduced for boilers, ships' plates, and other similar purposes.

Bessemer steel forms the subject of a separate article. Steel presents physical characteristics so distinct from those of malleable iron that it may be for practicable purposes regarded as a distinct metal. Its most remarkable physical characteristic is its power of becoming exceedingly hard by sudden cooling from a high heat, and of passing through many grades of hardness downward from that point by the process of tempering. The tempering is accomplished by reheating the metal to a certain degree and allowing it gradually to cool, and according to the heat to which it is raised is the resulting temper, the higher the heat the softer being the steel. In practice the color which bright steel assumes as its temperature rises is a sufficient guide to the workman in tempering bright steel articles. A light straw color indicates a heat of from 428° to 446° F., and gives the hardest temper required for lancets, etc. A full yellow 473° is employed for fine cutlery; at 509°, indicated by a purplish tinge, is the temper for ordinary cutlery obtained, and the shades of blue shown from 536° to 572° yield steel of high elasticity useful for watch springs and similar purposes. In the calendar year 1906 the manufacture of steel in the United States broke all records, the total production being 23,398,136 long tons. In 1907 it dropped to 23,362,594 tons, and in the business depression of 1908 to 14,023,247.

Steel Manufacture in the United States. To write of the manufacture of steel in the United States during the last century is indeed to begin at the beginning, since the Legislature of Pennsylvania, as late as 1786, lent Mr. Humphreys £300 for five years to enable him to try to make bar iron into steel "as good as in England." As late as 1810, there were produced in the whole country only 917 tons of steel, Pennsylvania's share being 531 tons, or more than half of the whole. It is remarkable that the good old Keystone State still makes about the same percentage. Even in 1831 the production of steel was only 1,600 tons, an amount which was said ther to equal the whole quantity imported, so that the market for steel was divided equally with the foreigner 70 years ago. But this steel was made chiefly by cementation; crucible steel was to come later. From

Steel Manufacture

1831 till as late as 1860, very little progress was made in developing the manufacture of steel, for the total product in 1850 was only 6,000 tons, still principally blistered steel. In 1840 Isaac Jones and William Coleman began its manufacture in Pittsburg, and succeeded. Singer, Nimick and Company in 1853 produced successfully the usual grades of cast steel for saws, machinery, etc.; for kindred purposes Hussey, Wells and Company in 1850, made the first crucible steel of best quality as a regular product out of American iron, and in 1862 came Park Brothers and Company, with the biggest steel plant of all up to that time, and several hundred English workmen imported to insure success. All these were in Pittsburg.

Henceforth the struggle with foreign steel became severe, till the invader was finally driven from the field. At first, European makers could "dump their surplus" upon the market and force American makers to accept for their entire output the extreme low rates which had only to be taken by the invader for a small part of his. The party in control of a profitable home market can most successfully invade foreign markets. In recent times it is the American manufacturer who is "dumping his surplus" in foreign territory. First conquer your home market, and the foreign market will probably be added to you, is the rule with manufactures in international trade.

As I write of Coleman, Jones, Nimick, Singer, Hussey and Park, I am carried back to boyhood, when as a messenger boy in the telegraph office in Pittsburg I delivered to them many a telegram, and received coveted recognition from these great men of my youth. Every one passed before my eyes as I wrote his name, as vividly as if I were still in daily intercourse with him. Were they in the next room and to speak, I could tell each voice before the word was ended. All are gone except the younger brother Singer, still my partner and friend. These are the fathers of steel in the United States. They "have done the State some service." Peace to their ashes!

It was not till 1864, when the last century was almost two-thirds gone, that the revolution in steel manufacture came to us, and the Iron Age began to give way to the new king Steel, for the first Bessemer product was made in that notable year, and steel, hitherto costing from six to seven cents per pound for ordinary grades, has since sold at less than one cent per pound, while billets by the hundred thousand of tons have sold at "three pounds of steel for two cents." Into this steel for each pound enter two pounds of iron ore mined and transported by rail and water 1,000 miles, one pound of coke, requiring one and one-third pounds of coal to be mined, coked, and transported 50 miles, one third of a pound of limestone, quarried and transported 140 miles; so that three and a third pounds of raw material have been made into one pound of steel and given to the consumer for two-thirds of one cent, three pounds for two cents being $15 for 2,240 pounds gross ton.

Were the writer asked how this miracle is performed, he could not tell, for never can he expel the doubt, when he thinks of it, that there must be some mistake, and that the concern which bestows this precious metal upon an ungrateful people for such a trifle must soon go to the wall. So, indeed, it would if this extremely low price had to be taken for any length of time, or for all forms of steel. There is not sufficient profit to cover the risks of business in three pounds of steel for two cents. Still, some of the largest concerns of the United States, which own all their raw materials and their own ships and railways and are properly equipped and managed, might reach this as their cost price, allowing nothing for dividends or for interest upon the capital invested. Interest approaches two dollars per ton and in most cases exceeds it. The risks of manufacturing, accidents and renewals, and of sales should be rated as two dollars per ton.

This low cost was made possible by the invention of Sir Henry Bessemer. Bessemer steel was enthroned as king, and no monarch seemed so sure of a long and undisputed reign, supplemented as the Bessemer process was by the invention of a young genius, my friend Sydney Thomas, who added the basic process, by which impure ores could be used in the Bessemer converter. Various contributory causes have made $15 a ton steel billets possible, among which automatic machinery ranks first, and in this the American excels; continuous processes rank second; workshops 1,100 and 1,200 feet long are becoming common, in which the raw material enters at one end, emerges finished at the other without handling, and often without even stopping except for reheating. The writer hears of plans today for new works upon such a scale that a mile and a quarter of land is required, one shop alone being 3,000 feet in length. One essential for cheap production is magnitude; concerns making 1,000 tons of steel per day have little chance against one making 10,000. We see this law in all departments of industry. It evolves the 20,000-ton steamship and the 50-ton railroad car. Improved engines and the use of electricity as a motor, the new loading and unloading machinery, are all contributory causes to the cheapening of steel. There is one element of cost, however, which every student of sociology will rejoice to know has not been cheapened, and that is human labor. It has risen and the tendency

Steel Manufacture

is to higher earnings per man. In one of the largest steel works last year the average wages per man, including all paid by the day, laborers, boys, and mechanics, exceeded $4 per day — for 311 days. Fewer men being required, the labor cost per ton is less, and contrary to the opinion often expressed, these men are of higher quality than ever as men. It is a mistake to suppose that men are becoming mere machines; the workman of former days would be unable to take charge of the complicated machinery of today, or to meet the demands made by present methods upon his brain and alertness.

Five years ago had one asked the steelmakers of the country whether there was any likelihood of the Bessemer process being rivaled, not one in a thousand would have hesitated to reply with an emphatic, Never! But the one in a thousand, conversant with recent experiments, would have been less emphatic, and intimated that perhaps even the Bessemer process might not remain without a rival.

The merits of the open-hearth Siemens furnace had been noted by at least one firm whose representative visited concerns abroad. The Thomas basic process was found to be remarkably well adapted to the open-hearth furnace, and an enterprising party in England had made some scientific experiments with it. To Cooper, Hewitt and Company is due the credit of having been the first to experiment with it in the United States. The cost of open-hearth steel was necessarily greater than the Bessemer, and so was restricted to few uses, but a new plant was only needed on a large scale, ready to benefit by the numerous improvements which clever men made in the course of development, to place the new process securely upon its feet as a rival to the Bessemer. There are now two kinds of steel made in the open hearth, the acid and the basic, the latter much cheaper than the former, though even purer, since the basic process eliminates the impurities thoroughly. Basic open-hearth steel is now used as a substitute for Swedish iron in many instances, even for horseshoes. Armor is made of it. The East River bridge is to be built of acid steel, for which a higher price is paid, but this is solely because its engineer is not open to demonstration. Its great advantage to the United States is that our enormous quantities of ores containing high phosphorus can be used for steel, while the Bessemer process requires ores comparatively free from this, the supply of which is limited. The product of open-hearth steel is rapidly increasing.

Thus, the age of iron, which passed away during the last century, was succeeded by the age of Bessemer steel, which enjoyed a reign of only 36 years, beginning as it did in 1864, and is in turn now passing away to be succeeded by the age of Siemens open-hearth steel. Already the product of open hearth is far beyond that of Bessemer in Great Britain, and such the writer ventures to predict will soon be the case in the United States.

The passing away of the Bessemer age has brought the South into prominence as a possible manufacturer of steel, when otherwise it never would have been in the field, its ores being unsuitable for the Bessemer, but probably soon to be proved adaptable to the open-hearth process. Until the new steel works of the Tennessee company have been fully started and run for some time it cannot be completely demonstrated whether steel can be made there cheap enough to make the South a great center for its manufacture. The experimental stage has not yet been clearly passed, since only part of the plant has been operated, but there seems little reason to doubt that any difficulties which may be met with will finally be overcome, and that the South is to become an important factor in steel manufacture.

The present center of steel is in the square made by a line drawn from Pittsburg to Wheeling, N. to Lorain, E. to Cleveland, and S. again to Pittsburg. In this territory most of the steel is made. Allegheny county alone (Pittsburg) in 1899 produced nearly one-quarter of all the pig iron in the United States, almost half of the open-hearth steel, and almost 39 per cent. of the total production of all kinds of steel. As far as the writer sees, there is little chance of this region being soon displaced; Colorado will, no doubt, expand as the W. coast is developed; Chicago's position as a manufacturer is assured. There is no sign of the great Southwest making steel to any extent. As late as the middle of the last century the Eastern States upon the Atlantic constituted the home of steel manufacture. Even in Pennsylvania the half of all the steel was made E. of the Alleghany mountains. Since then the trend has been constant and rapid to the region known as the central West which has Pittsburg as its metropolis. The transfer of the great Lackawanna Iron and Steel Works of Scranton, Pa., to Buffalo, N. Y., and the splendid triumphs of the Bethlehem Company (Pa.), in armor, guns, and forgings, as specialties which give it a unique and commanding position, are proofs that for the making of ordinary steel the location is not favorable. The history of the steel works at Troy is another case in point. There is one exception to this march W., at Harrisburg, in Eastern Pennsylvania, which remains a prosperous and important center of manufacture. The Maryland Steel Company at tide water has advantages for export, but probably more important for the future of that company are its developments in shipbuilding, for which it is peculiarly well adapted. So far as the writer sees

there is nothing to change the national center of steel manufacture in the new century; it is in the Central West, already described, and there it is likely to remain.

In that center itself there are causes at work which may lead to some important changes. The wonderful growth of the lake cities on the N. border of the central West region is shown by the recent census. These possess the advantages of the extremely low cost of lake transportation, the Welland canal, by which vessels of considerable tonnage can load at Conneaut and other lake ports direct for Europe, and above all, the low rates which the Erie canal insures manufacturers for more than half the year. These are attracting attention especially since an effort is being made to weld the trunk railway lines into one directorate to enable them to exact higher rates of freight when lower prices for service or articles seem to be the prevailing law. The selection of Buffalo by the Lackawanna Steel Company for its new works is evidence of a movement to the lakes. The policy of the railroad combination will inevitably operate in favor of the Southern ports and to the disadvantage of New York. The differential of three cents per 100 in favor of Baltimore and two cents in favor of Philadelphia over New York certainly means that the traffic will continue to seek these ports, and that New York's percentage of the shipping trade will steadily fall, as it has been doing. It is not to be supposed that the city and State of New York will fail to protect their position by improving the weapon which New York State alone of all States has in her waterway from the lakes to the port of New York. The writer takes this for granted, and consequently predicts a great development in steel manufacture in that part of the central West lying along the S. border of Lake Erie, which will inure to the benefit of New York as being the port which may be reached cheapest from the central West by water, One of the features of the 20th century is to be a return to water transport for heavy materials. Lake ships of 7,000 tons burden already exist. Barges will ply upon the Ohio river, soon to be slack-watered, and upon the enlarged Erie canal, as also upon that from Chicago to the Mississippi; and many other waterways will be opened upon which the raw materials for steel and the finished article itself are to be carried by manufacturers at rates already reached on the lakes, one-third and often one-fourth those charged by rail.

It is scarcely within the bounds of belief that any cheaper or better process of making steel remains to be discovered, or that improvement upon present methods can possibly be such as greatly to reduce cost and enable steel to be made without loss at less than three pounds for two cents. The 20th century, with all its wonders yet to be revealed, will probably end with the manufacture of steel substantially as it is now, by the open hearth. There does not seem room for much improvement.

The last few years have witnessed the export of steel from our country to other lands. The republic has not only supplied her own wants, but is competing to supply the wants of the world, not only in steel, but in the thousand and one articles of which steel is the chief component part. The cheapness with which steel is made is multiplying its uses to such an extent that estimates made of the possible wants of the world in the future can only be guesses. One illustration out of many that could be given is that three years ago there was not a ton of steel used for railway freight cars; today 1,000 tons of steel per day are used for that purpose alone — indeed, so rapidly is the use of steel extending that it is difficult to see how the world's demands can be filled. At present the mines of ironstone and of coking coal in Great Britain are worked to their full capacity, and yet the output is not greatly increased; it is the same with those of Germany, except that in the latter country there remain some inferior fields capable of development if prices rise, as is probable. Russia so far has not been much of a factor in steel making; if she is able to supply her own wants by the middle of the century she will be doing well. Except by the United States, Great Britain, and Germany, little steel is made, nor is any other nation likely to make much. The hopes in regard to China and Japan making steel, the writer believes, are delusive. Great Britain and Germany cannot manufacture much beyond what they do now, so that the increased wants of the world can be met only by the United States. The known supply of suitable iron ore here is sufficient to meet all possible demands of the world for at least half of the century; in the case of coke, for the entire century. It is not to be supposed that other deposits will not be discovered before known supplies are exhausted.

A few years hence the export of steel and manufactures of steel from the republic to many parts of the world, which in 1899 were valued at $119,000,000, promises to be so great as to constitute another chapter in the record-breaking history of steel.

The influence of our steel-making capacity upon development at home must be marvelous, for the nation which makes the cheapest steel has the other nations at its feet, as far as manufacturing in most of its branches is concerned. The cheapest steel means the cheapest ships, the cheapest machinery, the cheapest thousand and one articles of which steel is the base. We are on the eve of a development of the manufac-

turing powers of the republic such as the world has never seen, and the writer who is honored by being asked to write for a similar series its record of the 20th century may present figures as surprising as I have to submit for the 19th.

The republic's progress and commanding position as a steel producer are told in a few words:

In 1873 the United States produced 198,796 tons of steel; Great Britain, her chief competitor, 653,500 tons, more than three times as much. Twenty-six years later, 1899, the republic made more than double as much as the monarchy, the figures being 10,639,957 and 5,000,000 tons respectively, an eightfold increase for Great Britain and fifty-three-fold for the republic; and almost 40 per cent. of all the steel made in the world, which was 27,000,000 tons. Industrial history has nothing to show comparable to this.

So much for the past; as for the future, ere the present century runs one-third its course, perchance one-fourth, the United States is to make more steel than all the rest of the world combined and supply the wants of many lands besides her own.

Farewell, then, Age of Iron; all hail King Steel and success to the republic, the future seat and center of his empire, where he is to sit enthroned and work his wonders upon the earth! ANDREW CARNEGIE.

Steel Rails, Manufacture of. In the vast field of industry included in the various forms of steel making, there is none of greater importance than the manufacture of steel rails. For not only does rail making call for the services of a great industrial army, but the steel rail has contributed more than any other cause to the rapid weaving of that marvelous network of railways which now covers every State of the Union. Its high quality and skillful design have rendered possible the great increase in power, weight and capacity of American engines and rolling stock, and a low cost of operation which is the wonder and despair of European railroad systems.

The celebrated Edgar Thomson Works, which are devoted exclusively to the manufacture of steel rails, are situated on the Monongahela river, a few miles from the city of Pittsburg. Here some 4,000 men are employed night and day in turning out steel rails at the rate of from 5,000 to 6,000 every 24 hours, the rails varying in weight from 25 to 100 pounds per yard, and in length from 30 to 60 feet, the average rail being 30 feet in length and weighing about 75 pounds to the yard. The 60-foot rail is something of a novelty, though it has been rolled in this length for several years. It is open to the objection that in Northern States, where the range of temperature is large, the spacing of the rail ends at the joints has to be so wide that it is difficult to preserve an even and noiseless rail joint; hence, the call for 60-foot rails comes chiefly from Southern States, where the range of temperature is small.

The first point of interest in these works is the stock yards, which are laid out parallel with the long line of blast furnaces. Here are to be seen huge piles of iron ore, coke, and limestone. The iron ore is brought from the company's iron mines in the lake district, being carried in the company's own ships to Conneaut on Lake Erie, where it is transferred by special ore-handling machinery to trains of pressed steel ore cars, in which it is hauled over the company's own road to Bessemer. The trainloads of ore are brought into the yard and run on to a trestlework, where the hopper bottoms of the 50-ton cars are opened and the contents dumped on the stock heap. The coke is brought in from the great Connellsville coke region, and the limestone which is used in the blast furnace for a flux, is brought from the quarries at Tyrone. As showing the scale on which the Edgar Thomson furnaces are operated, it may be mentioned that there are in these works no less than 50 miles of standard gauge track, and that in 24 hours' time there is consumed in the furnaces 200 carloads of ore, 175 carloads of coke, and 75 carloads of limestone.

The blast furnaces, of which there are 9, are massive cylindrical structures of brick and steel, each about 90 feet in height and of varying external and internal diameter. The mouth of the furnace has an internal diameter of 15 feet, which increases in the first 60 feet of its depth to a diameter of 20 feet, the increase being given to allow an easy descent of the charge as it is reduced. The wall is 3 feet in thickness, and its weight is borne upon a circle of massive cast-iron columns. From its largest diameter the furnace tapers down to a diameter of 12 feet at the point where the hot blast tuyeres are introduced, and from these tuyeres to the bottom of the furnace it is cylindrical in form, the diameter here being 12 feet throughout. The walls are built of brick with an outer casing of sheet iron and an inner lining of fire brick. The upper part of the shaft consisting of 60 feet is called the body; the lower, tapering portion, the bosh; and below this is the hearth or crucible, into which the molten iron collects and from which it is tapped off. In the earlier days of steel manufacture, the furnace gases were allowed to escape into the air, but now the mouth is closed by a cast-iron bell which is opened only when a fresh charge is to be introduced. The confined gases are led from the top of the furnace by a large wrought-iron pipe, and conducted to a set of four hot-blast stoves, which are about 20 feet in diameter and

90 feet in height and have their interior filled with a mass of honeycombed fire brick. The hot gases are ignited at the base of the stove by the admission of a proper amount of air, and the hot products passing through the fire brick raise it to a high temperature. When the proper degree of heat is reached, the gases are turned into the next stove, and the cold blast from the blowing engines is turned in at the bottom of the heated stove, and passing up through the brickwork, absorbs the heat therefrom, and issues at a temperature of 1,300° to 1,400° F. The difference between the temperature of the cold blast and the issuing hot blast represents the heat which is saved from the gases and restored to the blast furnace. The heated air is introduced at the bottom of the blast furnace through a number of water-cooled tuyeres. The raw coke, limestone, and iron ore are carried up to the charging platform of the furnace by means of electrically operated elevators, and the charging goes on continuously. Under the fierce heat of the hot blast, the charge is maintained in a state of reduction almost to the top of the furnace, and when the material finds its way in the form of slag and molten iron to the bottom of the furnace, it is drawn away, the slag being tapped off from the top of the hearth and the molten metal from the bottom or crucible. From the time of putting a charge in at the top of the furnace to the time of drawing off the metal, is ordinarily about 30 hours. The slag is drawn off into trains of massive iron ladles, which are mounted on trucks running on a broad gauge track. These ladles, which have a capacity of 10 tons, are nicely balanced on trunnions, and are easily tipped for unloading the slag which is at present being used for filling in the low ground on the property of the Edgar Thomson Works.

The molten iron is tapped into 17-ton ladles which are drawn in trains of five or six to another part of the works where their contents are poured into the metal mixers. These latter are large, oblong iron boxes, each of which has a capacity of 175 tons. The train of ladles is drawn on to a raised track, where each ladle in succession is brought opposite the mixer and its contents poured in. The object of the mixers is to bring the mass of molten metal to a uniform temperature and quality, since the iron from one furnace may vary from that of another. The mixers are kept full all the time, and the contents are continuously being poured out by the tipping of the mixer into other 17-ton ladles in which the mixed metal is carried to the Bessemer converters.

The converter is a huge egg-shaped vessel built of heavy wrought-iron plate, lined internally with refractory materials and carried on trunnions, one of which is hollow and serves to conduct the air blast to the bottom of the converter. Here there are 15 or 20 tuyeres of fire clay, each of which is perforated with a number of ⅜ inch holes. By this arrangement between 150 and 200 separate streams of air are forced up through the body of the molten metal during the process known as the "blow." The converter charge is about 15 tons. When the blast is turned on, the air rushes up through the body of the metal, and its oxygen combines with the carbon, silicon, manganese, etc., in the iron, the combustion of these elements serving to raise the temperature of the metal till it reaches the stage known as the "boil." The process is carried on for 15 or 20 minutes, till all the impurities are burned out and only pure, or practically pure, iron remains. The blast is then shut off, and the charge is emptied into a 15-ton ladle. At the same time a certain amount of molten spiegeleisen is poured into the ladle with the iron, the proportion of spiegeleisen being such as to introduce into the metal the proper amount of carbon and manganese for the quality of steel rail that it is intended to roll. The ladle with its 15 tons of molten steel is placed on what is called the pouring stand, underneath which runs a small railway on which are trains of cast-iron ingot molds, each truck or car carrying two of the molds. The pouring ladle is provided with a nozzle and stopper in the center of its dome-shaped bottom, the discharge of the metal being regulated by a lever at the side of the ladle, as shown in the accompanying illustrations. The ingot molds are drawn by hydraulic power succes sively beneath the ladle and filled. After the ingots have set, the train of molds is hauled out to the yard and stripped, then the ingots are immediately taken to the pit heating furnace, or the "soaking pits" as they are called, where they are heated for rolling into "blooms." These ingots are of the proper composition of steel required for the particular quality of rail which is being rolled, and they constitute what might be called the raw material of the rail-making department.

Steel, Modern Structural. It is the popular idea that steel is a hard, polished metal like a dagger or a razor, and capable of carrying a cutting edge, but there are steels of various kinds that do not possess the qualities mentioned. Structural steel, for example, such as beams, girders and rough-rolled bars, generally has a much higher tensile strength, elasticity and tenacity than iron, and yet, in physical constitution and external appearance it differs but slightly from it. Of two bars, one iron and the other steel, put through the same rolls at the same heat, not even an expert could distinguish one from the other if they were laid side by side. Moreover, careful

analysis fails to discover the line of actual departure between steel and iron in the lower grades of each metal, or where the metal commences to be steel, so to speak, and stops being iron.

But as between the two metals, iron and steel, there is a vast difference in their endurance and ability to stand severe work, and modern engineers have a very great advantage over their predecessors of half a century ago in the possession of it. In modern open hearth and other process steels, the amount of fatigue or continuous resistance to crucial strains of long duration which they will endure is simply astonishing — not laboratory, or test-machine strains, but the downright pounding and flogging of daily work, which is far more serious than any testing machine can deliver. This last sets up a certain stress in a straight line, gradually increasing up to failure under it; but the duty imposed on steel by daily work in a high-speed engine, for example, is not only to resist tensile strains, but torsional and transverse burdens at one and the same time.

Consider the case of a 30,000 horse power marine engine worked under 200 pounds boiler pressure, and making nearly, if not quite, 1,000 feet of piston speed per minute; each one of the details under strain is twisted, pushed, pulled and pounded, as one may say, in all directions at each revolution, possibly 100 times a minute. Does it not require a metal of faultless integrity to hold on, not for one voyage, but for year after year with very few failures? Locomotives making high speed with heavy loads are subjected to still heavier tests of strength of details, for not only are they driven faster, but they have to sustain shocks and jars which are absent in marine engines; but instances of failure, compared to the number of engines in use, are few.

The physical qualities demanded for steel used in marine boilers by the United States Treasury rules would seem to be very exacting, inasmuch as they require a tensile strength of 60,000 pounds per square inch in the best, an elongation of 25 per cent. in two inches for plates of quarter inch thickness, and that the metal be capable of being bent on itself (doubled over) so that the inner radius of the bend shall be only one and one-half times the thickness of the plate, which must be heated to a low cherry red and quenched in water of 82° F. As a matter of fact American boiler plate will stand much severer tests than this; plates half an inch and even thicker can be bent down flat cold, so that the parts touch each other, without showing the least "craze" or fatigue on the inner or outer parts of the bend; withal, they will stand a very high heat for flanging purposes or dishing. We have seen plates flogged in a former by mauls, dished out like the crown of a derby hat, and reduced in thickness from ⅜ of an inch to $\frac{3}{16}$ of an inch at the finishing edges — over a diameter of four feet — without a flaw in the whole plate. This was stock ordered from the mill, taken as it ran, and by no means a special steel.

Wholly aside from the benefits constructing engineers derive from having such material is the security that engineers in charge of ships feel when running at high speeds. When iron was used this feeling did not exist, for there was never any certainty that there were not internal flaws that would give way suddenly under severe duty; but modern steel is so homogeneous in its structure that the percentage of failure from the cause named is very low.

Steele, George M. K., an American clergyman; born in 1824. In early life he taught school in Massachusetts; joined the New England Conference of the Methodist Episcopal Church in 1853; and held charges in Fitchburg, Lowell, Lynn, and Boston; was president of Lawrence University in Appleton, Wis., in 1865–1879; and principal of the Wesleyan Academy, Wilbraham, Mass., in 1879–1892, when he retired from active work. He died in Kenilworth, Ill., Jan. 14, 1902.

Steele, Sir Richard, a British author; born in Dublin, Ireland, in March, 1671; was educated at Charter House School and Oxford; entered the army and was promoted captain. He commenced his literary career in 1702 by writing for the stage. In 1709 he began the "Tatler" and four years later assisted with the "Spectator" and "Guardian"; soon after he entered the House of Commons as a member for Stockport, but was expelled for writing a satire, supposed to be a breach of privilege. On the accession of George II., he was knighted, given several lucrative posts and returned to Parliament. Steele is best known as an essayist. He wrote a religious treatise, "The Christian Hero" (1790). Among his plays are: "The Funeral, or Grief à la Mode," "The Tender Husband," "The Lying Lover," and "The Conscious Lovers." He died near Carmarthen, Wales, Sept. 1, 1729.

Steelton, a borough in Dauphin Co., Pa.; on the Susquehanna river, the Pennsylvania canal, and the Philadelphia and Reading, and the Pennsylvania railroads; 3 miles E. of Harrisburg. It contains electric railroads, a National bank, and daily and weekly newspapers. Here is the extensive plant of the Pennsylvania Steel Company, a flour mill, shirt factory, planing mill, and brick works. The assessed property valuation is about $15,000,000. Pop. (1890) 9,250; (1900) 12,086; (1910) 14,246.

Steendam, Jacob, the first poet of New York; born in Holland in 1616. He lived in New Netherlands in 1632–1662; and

wrote a small volume of verse, which was reprinted with memoir of the author (The Hague, 1861). The poems are descriptive of life in the colony, and are entitled: "Der Distelvink" (The Thistle Finch); "Klacht van Nieuw Amsterdam" (The Complaint of New Amsterdam); "Tlofran Nieuw Nederland" (The Praise of New Netherlands); and "Prichel Vaarsen" (Spurring Verses). The date and place of his death are not known.

Steenstrup, Johannes Iapetus Smith, a Norwegian zoölogist; born in Vang, Norway, March 8, 1813; taught mineralogical subjects at Sorö, in Denmark, and from 1845 to 1885 was Professor of Zoölogy at Copenhagen and director of the Zoölogical Museum. His books treat principally of hermaphroditism in nature, alternation of generations, flounders' eyes, and cephalopods. He also took a keen and active interest in exploring the kitchen middens of Denmark for evidences of prehistoric times. He died in 1897. His son, JOHANNES STEENSTRUP (born 1844), Professor of Northern Antiquities at Copenhagen, wrote a book about Viking life and times, "The Northmen" (1876–1882).

Steenstrupine, a mineral occurring in crystals and massive at Kangerdluarsuk, Greenland, associated with lepidolite, and ægyrite; hardness, 4.0; sp. gr., 3.38; color, brown. Composition: Essentially a hydrous silicate of cerium, lanthanum, didymium, thoria, soda, alumina, and sesquioxide of iron.

Steenwyck, Hendrik, a Dutch painter; born in Steenwyck in 1550. He excelled in the execution of church interiors, ablaze with tapers. He died in 1603. His son, Hendrik, called "the YOUNG STEENWYCK," was born about 1589, and became the friend of Vandyke, for whom he painted backgrounds. He died in London, in what year is unknown.

Steeplechase, a horse race run not on a course of smooth, flat turf, but across the open country, over hedges, ditches, walls, and whatever other obstacles lie in the way. This variety of sport seems to have had its origin (traditionally) in the frolic of a merry party of fox hunters, who agreed to race in a straight line toward a steeple visible in the distance, an event which is recorded to have happened in Ireland in 1803; further particulars of it, however, are not known. Nevertheless this was not the earliest race of the kind. One took place in Ireland in 1752 from the church of Buttevant (Cork county) to the church of St. Leger, a distance of 4½ miles. In the year 1816 a ride in England of 20 miles across country against time (under one hour and nine minutes) was regarded as something extraordinary, though about that time steeplechase matches were coming into fashion with the young fox hunters of the day. The sport began to assume its existing shape about the year 1831. In 1866 the Grand National Hunt Committee was formed for the purpose of laying down rules and regulations for the proper conducting of steeplechase meetings. The principal race in this class of sport in the United Kingdom is the Grand National, which was instituted at Liverpool the headquarters of steeplechasing in 1839; it is now run on different courses in different years. Among the more important steeplechase meetings are those of Liverpool, Newport Pagnell, St. Albans, Aylesbury, Lincoln, Brocklesby, and Leamington. Steeplechase races have always been greatly in favor in Ireland.

Steerage, an apartment or space between decks in a ship, forward of the main or chief cabin. In passenger ships it is assigned to the inferior class of passengers.

Steering Apparatus, the contrivance by which a vessel is steered, usually composed of three parts, viz., the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. The rudder or helm is a long and flat piece or frame suspended edgewise down the hind part of a ship's stern post, where it turns upon a kind of hinge to the right or left, serving to direct the course of a vessel, as the tail of a fish guides the body. The tiller is a bar of timber or iron, fixed horizontally to the upper end of the rudder and projecting within the vessel. The movements of the tiller are effected in small vessels by hand, assisted by a sort of tackle called the tiller rope. In larger vessels there are properly speaking, two ropes, or more commonly chains, which being wound about the axis or barrel of a wheel, act on the tiller with the power of a windlass. In the enormous modern vessels a ponderous system of braces and tackle became necessary to assist the working of the wheel. This was remedied by the introduction of hydraulic or steam-steering apparatus, which is a device interposed between the tiller wheel and the rudder head. There are numerous forms of apparatus, and by many mechanical improvements in steering machinery, manual labor at the wheel is now reduced to a minimum.

Steevens, George, an English Shakespearean commentator; born in Stepney in 1736; son of an East India Company director; became a foundationer at Eton and scholar at King's College, Cambridge. He was kept in difficulties all his days through his sarcastic temper and his habit of making bitter attacks on his friends from behind the anonymity of newspapers. Johnson's judgment was almost too lenient when once, in reply to Beauclerk's assertion "He

is very malignant," he said, "No, sir; he is not malignant. He is mischievous, if you will. He would do no man an essential injury; he may, indeed, love to make sport of people by vexing their vanity." At another time Johnson hit him off in the phrase. "He lives like an outlaw." Another favorite trick of Steevens was to set up mock commentators, as Amner and Collins, on whom to father annotations he did not wish to own. He began his literary life in 1766 with a reprint from the original quartos of "Twenty of the Plays of Shakespeare" (4 vols.). This work caused him to be employed as collaborator with Johnson in his edition (1773). Of this latter work a second edition appeared in 1778, to which Malone had contributed, and the latter printed in 1780 by way of supplement the doubtful plays and the poems, an act of independence which the jealous Steevens could not endure. Steevens then set to work with the help of Isaac Reed on a completely new edition of Shakespeare (1793; 1803), in which "instead of a timid and servile adherence to ancient copies," is adopted the "expulsion of useless and supernumerary syllables, and an occasional supply of such as might fortuitously have been omitted." This doctored text held its authority till the publication of Malone's posthumous edition, the famous "Variorum Shakespeare" (ed. by Boswell, 21 vols. 1821). In his great edition Steevens did not print the poems of Shakespeare, "because the strongest act of Parliament that could be framed would fail to compel readers into their service." Steevens died in Hampstead Jan. 22, 1800.

Steffens, Henrik, a Norwegian naturalist; born in Stavanger, Norway, May 2, 1773; entered Copenhagen University in 1790; and devoted himself to botany and mineralogy. After traveling at the expense of the Danish State in Norway (1794), and in Germany (1798), he was successively appointed lecturer at Copenhagen University (1802), professor at Halle (1804), at Breslau (1811), and at Berlin (1832), where he died Feb. 13, 1845. He was a foremost disciple of the school of Schelling. His chief works, remarkable for their variety, the abundance and freshness of their ideas, and the richness of their style, are: "Foundations of Natural Philosophy" (1806); "Anthropology" (1822); "Caricatures of the Deity" (1819–1821); "From False Theology and True Belief" (1831); the novels "The Families Walseth and Leith" (1827); "The Four Norwegians" (1828); and "Malcolm" (1831); collected under the title "Novels" (1837–1838); and his interesting autobiography, "What I Believe" (1840–1845).

Stegodon, in palæontology, a sub-genus of *Elephas,* with three or perhaps four species of extinct forms from the Indian Tertiaries. These were collectively named by Clift "Mastodon elephantoïdes," and constitute the intermediate group of the Proboscidea, from which the other species diverge, through their dental characters, on the one side into the mastodons, and on the other into the typical elephants. *S. insignis* abounded in the Sivalik Hills.

Stegophilus, in ichthyology, a genus of *Siluridæ.* Body narrow, cylindrical, and elongate, a small barbel at each maxillary; short, stiff spines in operculum and interoperculum. Stegophilus and the closely-allied genus *Vandellia* constitute the group Branchicolæ. They are from South America, and live parasitically in the gill cavities of larger fishes.

Stegosauria, in palæontology, an order of Cope's sub-class Dinosauria, with two families, *Scelidosauridæ* and *Stegosauridæ,* Feet plantigrade, with five digits, ungulate; fore-limbs very small, locomotion mainly on hind limbs; vertebræ and limb bones solid; a bony dermal armor; herbivorous.

Stegosauridæ, a family of *Stegosauria;* vertebræ biconcave; ischia directed backward, with the sides meeting in the median line; astragalus coalesced with tibia, metatarsals short. Genera: *Stegosaurus,* some 30 feet long, well armed with enormous bucklers, some of which were spinous, from the Jurassic beds of the Rocky Mountains; *Diracodon* and *Amosaurus.*

Stegostoma, a genus of *Selachoidei,* with one species, *S. tigrinum,* the tiger shark, from the Indian Ocean. Tail, with caudal fin, measuring one-half the total length; eyes very small; teeth small, trilobed, in many series, occupying a transverse flat patch in both jaws.

Stein (stīn), **Charlotte von,** the intimate friend of Goethe; born in Weimar, Germany, Dec. 25, 1742; married in 1764 to the duke's master of the horse. Her friendship with Goethe was broken suddenly after the poet's return from Italy (1788). They were, however, in some measure reconciled before Frau von Stein died. Goethe's "Letters" to her were first published in 1848–1851, and again, with additions, in 1883–1885; and another final collection was issued by the German Goethe Society in 1886. The lady's letters to Goethe were destroyed by her shortly before her death. She wrote a tragedy, "Dido." She died in Weimar Jan. 6, 1827.

Stein, Heinrich Friedrich Karl, Baron von, a Prussian statesman; born in Nassau, Germany, Oct. 26, 1757. After being educated at Göttingen and studying public law at Wetzlar, he entered the Prussian civil service, and after filling several important offices, was, in 1786, appointed president of the Westphalian Chambers, which post he

held till 1804, in which year he became Minister of Finance and Trade. In this capacity he laid the foundation of important social reforms; but, exciting the jealousy of Napoleon, he was exiled to Prague. In 1812 he went to St. Petersburg, where he rendered great services to the Russian government during the French invasion. Subsequently returning to his own country, he was placed at the head of administrative affairs, from which position he retired in 1827. He died in Kappenberg, Prussia, June 29, 1831.

Stein, Robert, an American linguist; born in Rengersdorf, Silesia, Prussia, in 1857; came to the United States in 1883 and engaged in teaching. He entered the United States Geological Survey in 1885 and became translator of German, French, Italian, Danish, Swedish, Norwegian, Russian, Dutch, Spanish, Portuguese, and other languages. In 1897 he joined the seventh Peary expedition, and in 1899 took passage on the "Diana" to explore Ellesmereland. He was the author of various articles on economic and social subjects, and Arctic exploration.

Steinbok, or **Steenbok,** in zoölogy, the *Antilope tragulus,* from the stony plains and mountains of South Africa; rather more than three feet long, and about 20 inches high at the shoulder; red brown above, white below; tail rudimentary, ears large; horns straight, about four inches long in the male, absent in female; no false hoofs. Also, the ibex.

Steinitz, William, a German chess player; born in Prague, Bohemia, May 17, 1836; was the world's chess champion for many years, winning either first or second place in every tournament from 1862 till 1894, when Emanuel Lasker defeated him. He lived in London from 1862 till 1883, when he came to New York and soon after published the "International Chess Magazine." He wrote a "Modern Chess Instructor." He died Aug. 12, 1900.

Steinmetz (stīn'metz), **Karl Friedrich von,** a Prussian military officer; born in Eisenach, Germany, Dec. 27, 1796; entered the army in 1813 and fought against Napoleon through the campaign of 1813–1814 winning the Iron Cross for valor, and in the war of 1866 as commander-in-chief of the 5th Army Corps routed three successive Austrian corps (June 27–29). On the outbreak of the Franco-Prussian War of 1870, he was put in command of the right wing of the German advance; but owing to friction with other officers he lost his independent command in 1870; was nominated governor-general of Posen and Silesia, and made field-marshal general in 1871. He died in Landeck, Prussia, Aug. 4, 1877.

Steinthal (stīn'täl), **Heymann,** a German philologist; born in Gröbzig, Anhalt, Germany, May 16, 1823; studied philology and philosophy at Berlin, and from 1850 became a lecturer in the science of language and mythology. The years 1852–1855 he gave to the study of Chinese at Paris, and in 1863 became Professor Extraordinary of the Science of Language at Berlin; from 1872 also lecturing at the Jewish High School on Old Testament criticism, ethics, and the philosophy and history of religion. In his method he shows strongly the influence of W. von Humboldt, and he himself edited the philological writings of his master (1884). He published: "Classification of Languages" (1850); "The Origin of Language" (1851); "The Evolution of Writing" (1852); "The Mutual Relations of Grammar, Logic, and Psychology" (1855); "History of Philology Among the Greeks and the Romans" (1867); "Abstract of Philology" (1871); "Universal Language" (1871); etc. He died March 14, 1899.

Stela, or **Stele,** in architecture, a small column without base or capital, serving as a monument, milestone, or the like. In archæology, a sepulchral slab or column, which in ancient times answered the purpose of a gravestone.

Stellaland, a short-lived South African republic, formed in 1882 by the Boers who supported Massouw, a chief of the Batlapins, against his rival Mankoroane, who relied on the British. In 1884 the British government assumed the administration of the country, and in the following year annexed it and incorporated it in the new colony of Bechuanaland. The capital is Vryburg, connected by rail with Kimberley.

Stella Mira. See Mira.

Stelvio, Pass of the, the highest carriage road across the Alps (9,042 feet), leads from Bormio near the head of the Italian Valtelline to Spondinig in the Vintschgau valley of the Austrian Tyrol. It forms part of the great road between Milan and Innsbruck, and was completed by the Austrian government in 1825. It has a length of 33 miles, and is remarkable for its magnificent scenery.

Stem, in botany, the ascending axis of a plant. It seeks the light, strives to expose itself to the air, and expands itself to the utmost extent of its nature to the solar rays. With regard to direction, it may be erect, pendulous, nodding, decumbent, flexuose, creeping, or climbing. It is generally cylindrical; but may be triangular, as in *Carex;* square, as in the *Labiatæ;* two-edged, as in some *Cacti;* filiform, as in flax; or leaf-like, as in *Ruscus.* It consists of bundles of vascular and woody tissue embedded in various ways in cellular substance, the whole being inclosed with an epidermis. Stems may be aërial or underground. The most highly developed form of

the former is the trunk of a tree, the next is that of a shrub. There are also herbaceous stems. Sometimes a plant appears stemless; only, however, because the stem is short enough to be overlooked. In duration a stem may be annual, biennial, or perennial. In structure it may be exogenous, endogenous, or acrogenous. Aërial stems generally branch and bear leaves, flowers, and fruit. An underground stem is often mistaken for a root, but differs in its capacity of bearing leaves. (See RHIZOME.)

In mechanics, the projecting-rod which guides a valve in its reciprocations. In mining, a day's work. In music, the line attached to the head of a note. All notes used in modern music but the semibreve, or whole note, have stems; quavers and their sub-divisions have stems and hooks. In writing a "single part" for a voice or instrument, it is usual to turn the stems of notes lying below the middle line of the stave upward, of notes lying above the middle line downward. Notes on the middle line have their stems up or down as seems best. In a "short score," as for four parts the stems of the higher part in each stave are turned up, those of the lower part down. In ornithology, the main stalk of the feather bearing all the other external parts, and usually resembling a greatly elongated cone. At the lower part which is inserted in the skin, it is cylindrical, hollow, and transparent; higher up it is filled with a cellular pith. The parenchymatous portion of the stem is called the shaft, and it is from the flattened sides of this that the barbs issue.

In shipbuilding, the upright piece of timber or bar of iron at the fore end of a vessel, to which the forward ends of the stakes are united. With wooden stems the lower end is scarfed into the keel. The upper end supports the bowsprit, and in the obtuse angle is the figure head. The advanced edge of the stem is the cut-water. It is usually marked with a scale of feet, showing the perpendicular height above the keel, so as to mark the draught of water at the forepart. Called also stem post. In vehicles, the bar to which the bow of a falling hood is hinged.

Stencil, a thin plate of metal, cardboard, leather or other material (brass generally), out of which patterns, numbers, or letters have been cut. The plate is laid on the surface to be painted or marked, and a brush dipped in ink or color is then rubbed over it, the surface receiving the color only through the parts cut out of the plate.

Stendal, a town of Prussian Saxony; 36 miles N. by E. of Magdeburg; was the former capital of the Altmark and has a Gothic cathedral (1420–1424), a Roland pillar, two old gateways, and a statue of Winckelmann, a native of the place. There are here large railway workshops and important textile industries. Pop. (1905) 23,278.

Stendhal. See BEYLE, MARIE HENRI.

Stenness, or **Stennis,** a loch in the Orkney Islands, a few miles N. E. of Stromness, 14 miles in circumference. It is remarkable for the two groups of standing stones, somewhat similar to those of Stonehenge, which are found on its shores. The smaller group, of which only two remain erect, belong to an area 100 feet in diameter with an outside ditch 50 feet in width. The larger group known as the Ring of Brogar, consists now of 15 stones in an inclosure 340 feet in diameter. See STANDING STONES.

Steneosaurus, a genus of amphicœlian crocodiles, with six species from the Jurassic. With the exception of their biconcave vertebræ, they present many points of resemblance to the living gavials. They attain a considerable size, for the skull of one species, *S. herberti,* is about 40 inches long.

Steno, Nicholas, a Danish anatomist; born in Copenhagen, Denmark, in 1638. He studied medicine, especially the anatomy of the glands, the heart and the brain, and was the discoverer of "Steno's duct." He turned his attention to geology and was the first to point out the true origin of fossil animals; he treated of the structure of the earth's crust, clearly portraying the prevalent stratification of rocks, and discriminating between their volcanic, chemical, and mechanical modes of origination. He led a wandering life in Holland, France, Austria, Hungary, Italy, but in 1667 settled in Florence and was converted to the Roman Catholic faith; became a man of marked piety, was made bishop, and in 1677 was dispatched by the Pope to the N. of Germany to act as vicar-apostolic of those regions. He died in Schwerin, Germany, Nov. 25, 1687.

Stenochromy, a process of polychrome printing, brought to considerable perfection by Otto Radde of Hamburg, and patented by him in Great Britain. A color block representing a picture or design is built up after the manner of a mosiac, with soapy compositions, prepared by thoroughly incorporating pure pigments with fatty substances. The color compositions melt with heat, solidify on cooling, and possess the same specific gravity and yielding power. The method of forming the color block is as follows: A shallow wooden frame of the size of the intended picture is taken, and into a portion of it marked off with strips of brass placed edgewise, a quantity of liquid color is poured. As soon as the color has solidified the required outline is traced on it, the brass strips are removed and the color is cut vertically to the tracing by means of a peculiar knife. Another compartment or cell is then formed with the pieces of metal, and a second color is poured

in and cut vertically as required. The same plan is followed with all the other colors, and when the picture is completed, the surface is leveled, and impressions are taken on paper of an absorbent nature with slight pressure in a kind of lithographic press. The stenochrome is finished by an overprint from a stone which marks the outlines. For highly-finished pictures from two to four overprints are necessary to obtain proper blending effects.

Stenodermata, a group of bats, family *Phyllostomidæ,* from the Neotropical region. Muzzle very short, and generally broad in front; nose-leaf generally short, horseshoe-shaped in front and lanceolate behind; interfemoral membrane always concave behind; no tail; inner margin of lips fringed with conical papillæ.

Stenography. See SHORTHAND.

Stenorhynchinæ, in zoölogy, a sub-family of *Phocidæ,* with five genera, *Monachus, Stenorphynchus* (=*Ogmorhinus,* Pet.), *Lobodon, Leptonyx,* and *Ommatophoca.* Molars two-rooted, except the first. On the hind feet the fourth and fifth toes greatly exceed the others in length; nails rudimentary or absent. Monachus from the Mediterranean, the other genera from the shores of the Southern Hemisphere.

Stentor, the name of a Greek herald in the Trojan war, famous for the loudness of his voice, which was said to equal that of 50 other men together; hence, a person having a very loud strong voice. In zoölogy, trumpet animalcule; the type-genus of *Stentoridæ,* cosmopolitan, with numerous species, from salt and fresh water, mostly social. Animalcules sedentary or mobile at will; body conical or trumpet-shaped, often brilliantly colored, covered with cilia, anterior portion widened and fringed with a marginal row of longer cilia, with a spiral row extending from the mouth. They are among the largest and most beautiful of the class, of which they are the earliest known members, the first record of them being by Trembley who described them under the name of funnel-like Polypes. They increase by oblique fission and by germs separating from the band-like endoplast. One species, *S. niger,* is common in ponds in Epping Forest, England.

Stephanite (after the Archduke Stephan of Austria), an ore of silver occurring both in crystals and massive; crystallization, orthorhombic; hardness, 2–2.5; sp. gr. 6.269; luster, metallic; color and streak, iron-black. Composition: Sulphur, 16.2; antimony, 15.3; silver, 68.5 = 100, corresponding with the formula $5AgS+Sb_2S_3$. Occurs with other silver ores in lodes in various localities.

Stephen, the name of several popes; some authorities reckon 9, and others 10, the discrepancy arising from the omission of a pontiff who died between election and consecration (752) and who is therefore not generally included in the series of popes.

STEPHEN I., ascended the pontifical chair after Lucius, in 253. He had a difference with St. Cyprian and Firmilian about rebaptizing repentant heretics, which practice this Pope condemned. He died in 257.

STEPHEN II., a native of Rome; elected Pope in 752. Astolphus, King of the Lombards, having menaced the city of Rome, Stephen implored the aid of Constantine Copronymus, Emperor of the East; but he being engaged in a war recommended his cause to Pepin, King of the Franks, who marched into Italy and deprived Astolphus of the exarchate of Ravenna and several cities, which he gave to the Pope, thus laying the foundation of the temporal sovereignty of the Church of Rome. He died in 757.

STEPHEN III., succeeded Paul I. in 768. Throughout his career he was at variance with the Lombards and threatened to excommunicate Charles (afterward Charlemagne) and Carloman, sons of Pepin, if they entered into an alliance with them, or intermarried with the daughters of the Lombard king. Charles, however, married Hermengarda, daughter of Desiderius, King of the Lombards, but put her away a year afterward. Stephen was succeeded by Adrian I. He died in 772.

STEPHEN IV., succeeded Leo III. in 816, but died in the same year.

STEPHEN V., elected in succession to Adrian III., in 885. He was a learned pontiff and greatly contributed to relieve the people of Rome from the effects of a terrible famine which had desolated the country shortly before his accession. He died in 891.

STEPHEN VI., became Pope in succession to Romanus in 897. He caused the body of Pope Formosus to be disinterred and cast into an ordinary grave, on the plea that the Pope had been excommunicated by John VIII. anterior to his elevation to the tiara. In 898 the partisans of Formosus burst into an insurrection, and having seized Stephen strangled him.

STEPHEN VII., the successor of Leo V., was elevated to the papacy in 929. There are no reliable records of his pontificate. He died in 931.

STEPHEN VIII., the successor of Leo VIII. At the time of his election, 939, Rome was governed by Alberic, son of Marozia, who styled himself "Prince and Senator of all the Romans." The records of his papacy are extremely untrustworthy; but it is stated by one authority that Stephen VIII.

was, during a revolt of the Roman populace, rendered a cripple for life. He died in 942.

STEPHEN IX., elected to the papacy in succession to Victor II. in 1057. He had previously filled the office of papal legate at the court of Constantinople. After his elevation, he dispatched legates to Milan to enforce celibacy among the clergy of that church; the disputes on which decree lasted during a quarter of a century. He was a learned and energetic pontiff, but too ambitious of worldly influence. He died in 1058.

Stephen, the name of several kings of Hungary, viz.:

STEPHEN I., succeeded his father Geisa in 997. He reformed the manners of his subjects, enacted excellent laws and introduced Christianity into his kingdom. He died in 1038. Stephen was canonized and his memory is held in great veneration throughout Southern Germany, where churches are met everywhere dedicated to his name.

STEPHEN II., succeeded his father Koloman in 1114. He invaded Poland and Austria, and marched into Russia, but was unsuccessful everywhere. He abdicated, retired to a monastery, and died in 1131.

STEPHEN III., crowned king in 1161; was almost immediately deposed by the nobles. He regained the crown, however, in 1165, and reigned till 1174.

STEPHEN IV., ascended the throne in 1161, but was defeated by the preceding in 1163, soon after which he died at Semlin.

STEPHEN V., reigned two years only, but gained an illustrious name by his victories over Ottocar, King of Bohemia, 1270–1272.

Stephen, King of England; son of the Count of Blois by his wife Adela, daughter of William the Conqueror; born in Blois, France, in 1105. Being in England on the death of Henry I., he seized on the crown and royal coffers, to the prejudice of Henry's daughter, Matilda, the empress, and was crowned in 1135. Four years elapsed before Matilda was able to land with forces to dispute Stephen's possession of the throne, and after a long civil war that lasted nearly the whole reign and in which Stephen was once taken prisoner but released for Matilda's brother, the Earl of Gloucester, it was finally decided that Stephen should retain the crown for his own life, on condition that Prince Henry, Matilda's son by her first husband, should succeed. These terms were concluded in 1154. He died in Dover, England, Oct. 25, 1154.

Stephen, King of Poland, surnamed BATHORI; a noble Hungarian; born in 1532, elected Prince of Transylvania, 1571, and succeeded to Henry of Valois as King of Poland, 1575. He died in Grodno, Poland, Dec. 12, 1586.

Stephen, Leslie, an English author; born in London, Nov. 28, 1832. He was educated at Cambridge, and subsequently edited leading London periodicals. His greatest undertaking was the "Dictionary of National Biography" in about 60 volumes, of which he edited the first 26. He published: "Hours in a Library" (1871–1879); "Essays on Free Thinking and Plain Speaking" (1873); "History of English Thought in the Eighteenth Century" (1876); "Science of Ethics" (1882); "Life of Henry Fawcett" (1885); "An Agnostic's Apology" (1893); "Life of Sir James Fitzjames Stephen" (1896): "Studies of a Biographer" (1898), etc. Knighted in 1902; died Feb. 22, 1904.

Stephens, the English equivalent of the French family name of ESTIENNE or ETIENNE, celebrated as printers and publishers. The first of the family (descended from a line of Provençal nobles) to embark in this business was HENRY STEPHENS (1460–1520), who settled in Paris about 1500. His business was taken up in 1526 by his second son ROBERT (born 1503), having in the interval been managed by his stepfather. Robert specially distinguished himself by the excellence of his workmanship, and was in 1539 and 1540 appointed printer to the king in Latin, Greek, and Hebrew. Early in life he became a convert to the doctrines of the Reformation; and on more than one occasion he got into difficulties with the theological authorities of the University of Paris for introducing editorial changes in the text of the Bibles and Testaments he printed. In 1550 indeed he found it prudent to retire to Geneva. There he remained till his death Sept. 7, 1559, and published several of Calvin's works. Robert Stephens was a scholar as well as a printer; he published and printed in 1532 a Latin dictionary ("Thesaurus Linguæ Latinæ") which remained a standard work down to the middle of the 18th century. Among his editions of the Holy Scriptures the Latin New Testament of 1523, the Latin Bible (folio) of 1528, and the Greek New Testament of 1550 deserve special mention. Being a lover of the New Learning he also printed several of the classic authors, numerous Latin grammars, and similar books. Robert's brother CHARLES (1504–1564), who graduated in medicine and practised in Paris, took charge of his brother's business when he withdrew to Geneva, and wrote and printed himself an encyclopædic work ("Dictionarium Historicum ac Poeticum," 1553), a collection of ancient treatises on agriculture ("Prædium Rusticum," 1554), and other books. Robert's eldest son HENRY (born in Paris in 1528) worthily sustained the reputation of the family. He received an excellent education and became celebrated for his knowledge of Greek. Both before and after he settled down at Geneva (in 1551), he

traveled in Italy, England, and the Netherlands, collating MSS. (mostly Greek), and consorting with scholars. In 1556 he set up a press of his own in Geneva, and issued from it a great number of the ancient Greek authors, including some 20 "first editions." His greatest achievement as a scholar was a Greek dictionary entitled "Thesaurus Græcæ Linguæ" (5 vols. folio, 1572), on which he spent nearly all his fortune. In his editions of classic authors he indulged in many textual emendations, most of them based on MS. authority, but some purely conjectural. From about the year 1578 he led a very restless and wandering life, and his business was greatly neglected, till at length he died in Lyons early in 1598. He also wrote his mother tongue with force and elegance, his most remarkable production in it being the semi-satirical "Apologie pour Hérodote" (1566). The traditions of the family were kept up by PAUL (1566–1627), the son of Henry (II.) Stephens, who printed valuable editions of Euripides (1602) and Sophocles (1603); and by Paul's son ANTOINE (1592–1674), who became king's printer at Paris, and among other books printed a Septuagint.

Stephens, Alexander Hamilton, an American statesman; born near Crawfordsville, Ga., Feb. 11, 1812; was graduated at

ALEXANDER H. STEPHENS.

Franklin College in 1828 and admitted to the bar in 1834. He was chosen a member of the lower branch of the legislature of Georgia in 1836; elected to Congress in 1843; and in 1847 submitted a series of resolutions in relation to the Mexican War, which afterward formed the platform of the Whig party. Shortly after the outbreak of the Civil War he was elected vice-president of the Confederate States of America, and on March 21, 1861, delivered a speech in Savannah, in which he declared slavery to be the cornerstone of the new government. In February, 1865, he was at the head of the Peace Commission of the Confederate government in the Hampton Roads conference. After the war he turned his attention to literary pursuits and published "The War Between the States" and edited the Atlanta "Sun." He was again elected to Congress in 1874, and reëlected in 1876 serving till 1882, when he resigned to become governor of Georgia. He died in Atlanta, Ga., March 4, 1883.

Stephens, Alice Barber, an American illustrator; born in New Jersey in 1858; first became prominent as a wood-engraver for "Scribner's Magazine." Later she illustrated extensively for "Harper's Magazine," "The Century," and other publications including the "Ladies' Home Journal"; and also taught in the portrait and life classes of the Philadelphia School of Design for Women.

Stephens, Ann Sophia (Winterbotham), an American novelist; born in Derby, Conn., 1813. After 1837 she resided in New York, and was at different times engaged in editorial work. The most noted of her poems is "The Polish Boy"; and of her novels, "Fashion and Famine" (1854). Among her other publications are: "The Old Homestead" (1855; 2 vols. 1860); "Sibyl Chase" (1862); "Ahmo's Plot" (1863); "The Heiress of Greenhurst"; "Married in Haste," and "A Pictorial History of the War for the Union." She died in Newport, R. I., Aug. 20, 1886.

Stephens, Charles Asbury, an American author; born in Norway Lake, Me., in 1847. He published: "Camping Out"; "Off to the Geysers"; "Left on Labrador"; "Fox-Hunting"; "On the Amazon"; "The Young Moose-Hunters"; "The Knockabout Club in the Woods," and the same "Alongshore" and "In the Tropics"; also works on biology, "Living Matter"; "Pluricellular Man"; and "Long Life."

Stephens, George, an English archæologist; born in Liverpool, England, Dec. 13, 1813; educated in University College, London. He settled early at Stockholm, and was appointed in 1851 lector, later Professor of English in the University of Copenhagen. His works are numerous and learned, the most important "Old Northern Runic Monuments of Scandinavia and England" (3 vols. 1866–1884); and its abridgement, containing, however, all the engravings and translations (1884). Other works are on the Ruthwell Cross (1868), on Bugge's Studies in Northern Mythology (1883), and his early translation into English of Tegner's "Frithiof" (Stockholm, 1841). He died Aug. 13, 1895.

Stephens, James Brunton, an Australian author; born in Borrowstounness, Linlithgowshire, Scotland in 1835. He was author of "Convict Once: A Poem" (1871);

"The Black Gin, and Other Poems" (1874); "A Hundred Pounds: A Novelette" (1876); "Miscellaneous Poems" (1880); "Fayette," a comic opera.

Stephens, James, a noted Fenian; born in Kilkenny, 1824; son of an auctioneer's clerk with more of Saxon than of Celtic blood. He had a good education, took early to mathematics, and at 20 obtained an appointment during the making of the Limerick and Waterford railway. He next went to Dublin, and soon became one of the most active agents of the Young Ireland party. He was slightly wounded at the scuffle of Ballingarry (June 29, 1848), lived for three months thereafter among the mountains from Tipperary to Kerry, and then sailed from Cork to France disguised as a lady's servant. For some years he lived mainly at Paris, where he obtained an insight into the working of continental secret societies, and in 1853 journeyed over Ireland making himself acquainted with its condition and preparing the soil for the Fenian conspiracy. As its "Head Center" he exercised an enormous and despotic influence, and throughout showed remarkable dexterity in the disguises and characters he assumed on his visits to all parts of Ireland. He visited the United States early in 1864 to attempt to overthrow the rival schemes formed there by patriots, and was arrested in Dublin on Nov. 10, of the same year. Fourteen days later he made his escape from Richmond Bridewell in a manner so suspicious that many have looked for the explanation rather to government connivance than to the treachery of officials. He found his way to New York, where he was formally deposed by the Fenians. He was allowed to return to Ireland in 1891. He died in Dublin March 29, 1901.

Stephens, John Lloyd, an American author; born in Shrewsbury, N. J., Nov. 28, 1805; was graduated in 1822 at Columbia College; studied law and practised in New York. He made an extended journey through Europe and the East, an account of which he supplied in letters to Hoffman's "American Monthly Magazine," and afterward published in fuller narrative form under the title of "Incidents of Travel in Egypt, Arabia, Petræa, and the Holy Land" (1837), and "Incidents of Travel in Greece, Turkey, Russia, and Poland" (1838). In 1839 he was sent by the United States government to negotiate a treaty with the government of Central America; and as the result of his experiences and investigations in that country he published "Incidents of Travel in Central America, Chiapas, and Yucatan" (1841); and after further exploration, "Incidents of Travel in Yucatan" (1843), describing the ruined cities and monuments of this part of America. He was one of the organizers of the first Atlantic steam navigation company and one of the first presidents of the company which constructed a railway across the Isthmus of Panama, and superintended the construction. He died in New York city Oct. 10, 1852.

Stephens, Uriah Smith, an American labor reformer; born near Cape May, N. J., Aug. 3, 1821; educated for the Baptist ministry; after serving apprenticeship as a tailor taught school in New Jersey; in 1845 removed to Philadelphia; in 1853 went to the West Indies, Central America, and California; in 1858 returned to Philadelphia; Dec. 9, 1869, with six others he founded the Knights of Labor; Jan. 6, 1870 was chosen first Master Workman of General Assembly No. 1; Dec. 28, 1871 was chosen statistician; in 1873 was chosen first District Master Workman of District Assembly No. 1; Jan. 1, 1878 was chosen first Grand Master Workman of the General Assembly. He died in Europe Feb. 13, 1882.

Stephenson, George, an English engineer; born in Wylam, England, June 9, 1781. At the age of 14 he joined his father in his work as fireman in a colliery, where, he acquired a large amount of sound practical knowledge. In 1812 he was appointed engineer to the colliery, at a salary of $500 a year. Soon after this he built his first traveling engine to draw the wagons along the tramway, which, though clumsy and weak in power, was immensely superior to any engine then in use. Improvement followed on improvement in rapid succession, not only in the form of the locomotive, but in the rails and in every department to which steam was applicable. In 1822 he opened the first railway, eight miles long. The whole system of railway locomotion with all its complications of stations, signals, tenders, and carriages, was completed by the opening of the Liverpool and Manchester Railway in 1830. In 1845 he retired from all railway undertakings, after having been instrumental in establishing all the foreign and home lines. He died near Chesterfield, England, Aug. 12, 1848.

Stephenson, Robert, a British civil engineer, only son of George Stephenson; born near Newcastle-upon-Tyne, Oct. 16, 1803; joined his father in his operations on the Liverpool line; became the permanent engineer of that company; surveyed several new lines, visited South America to inspect the gold and silver mines of that country; and established a name as the first civil engineer in Europe. Among the works with which Robert Stephenson's name is associated, are the High Level Bridge over the Tyne, the Tweed Viaduct, the Britannia Bridge over the Menai Straits, the Victoria Bridge at Montreal across the St. Lawrence, one of the grandest of engineering achievements, and the Alexandria and

Cairo railway. In 1847 he entered Parliament for Whitby; he was a Fellow of the Royal Society, and a member of nearly all the scientific societies of Europe. He published two valuable works, "The Locomotive Steam Engine," and "The Atmospheric

ROBERT STEPHENSON.

Railway System." He died in London Oct. 12, 1859, and was buried in Westminster Abbey where there is a memorial window in his honor.

Stepniak (stĕp'nyak), **Sergius Michael Dragomanov,** a Russian revolutionist; born in Gadjatch, Poltava, Russia, in 1841. Exiled in 1876 on account of his criticisms on the system followed by Count Tolstoy, minister of justice, he settled in Geneva in 1887; went from there to London in 1885. Among his works are "The Turks Within and Without" (1876); "Underground Russia" (1881); "Tyrannicide in Russia" (1881); "The Russian Peasantry"; "Historical Poland and the Muscovite Democracy" (1881); "Little Russian Internationalism"; "The Propaganda of Socialism"; "Russia under the Czars"; and "The Career of a Nihilist," a novel (1889). He was a frequent contributor to periodicals and assisted in editing the folk songs of Little Russia. In 1891 he visited the United States. He died in London, England, Dec. 23, 1895.

Steppe, a term applied to one of those extensive plains which, with the occasional interpolation of low ranges of hills, stretch from the Dnieper across the S. E. of European Russia, round the shores of the Caspian and Aral seas, between the Altai and Ural chains, and occupy the low lands of Siberia. In spring they are covered with verdure, but for the greater part of the year they are dry and barren. There are three different kinds of steppe, viz., grass, salt, and sand steppes, each maintaining peculiar forms of vegetation.

Stercoranism, in Church history, the belief that the eucharistic elements suffered physical change in the body of the recipient. During the controversy on transubstantiation, in the 11th century, the charge of stercoranism was brought against the believers in and the objectors to that dogma by their respective opponents.

Stercorarius, in ornithology, the skua, a genus of *Laridæ*, in some classifications made a sub-family *Stercorariinæ*. These birds were at first classed with the gulls, but were separated on account of differences in external character and habits, and placed in a separate genus, *Lestris*. The Linnæan name *Stercorarius* was adopted by Brisson, with a generic description, in 1760, and is now revived by those authors who are endeavoring to purify nomenclature and to restore to use names originally given.

Sterculia, in botany, the typical genus of *Sterculiaceæ*. Trees with soft timber; leaves simple or compound; inflorescence in racemes or panicles; flowers polygamous or monœcious; calyx somewhat coriaceous, five-lobed; petals none; carpels follicular, five or fewer, each with one cell and one or many seeds. *S. urens* is a large Indian tree, with white bark, cordate leaves, and very small flowers in terminal panicles, coming out in February or March. The tree yields an inferior sort of tragacanth, used in the hospitals at Bombay and in making sweetmeats, and native guitars are made of the wood. Its seeds are cathartic. *S. villosa*, another Indian tree, yields a similar gum of little value. The bark of these, and of *S. colorata* and *S. guttata*, also Indian trees, yield fibers adapted for cordage. An oil may be extracted from the seeds of *S. fœtida*, a large East Indian evergreen, by boiling them in water. The seeds of *S. tomentosa* and *S. acuminata*, African species, when chewed and sucked, render half-putrid water agreeable. *S. tragacantha*, of Sierra Leone, yields tragacanth. The nuts of *S. balanghas*, *S. fœtida*, and *S. urens* are eaten in India, and are sometimes roasted like coffee, as are those of *S. nobilis* in the East Indies, and those of *S. chicha* and *S. lasiantha* in Brazil.

Sterculiaceæ, in botany, Sterculiads; an order of hypogynous exogens, alliance Malvales; large trees or shrubs, having the hairs, if present, stellate; leaves with free deciduous stipules; calyx naked or surrounded by an involucre; sepals five, more or less united at the base, æstivation generally valvate; petals five or none, æstivation

convolute; stamens indefinite, monadelphous; anthers two-celled, turned outward; styles five or three; fruit capsular, three or five-celled, or drupaceous, berried, or consisting of distinct follicles; seeds sometimes winged or woolly. They are natives of warm countries: tribes, Bombaceæ, Helicteræ, and Sterculeæ; genera, 34; species, 125.

Stère (stār), the French unit for solid measure, equal to a cubic meter, or 35.3156 cubic feet.

Stereobate, in architecture, a kind of continuous pedestal at the bottom of a plain wall; distinguished from a stylobate, under a series of columns or pilasters.

Stereochromy, a process of mural painting in which water glass is employed to fix or consolidate the colors. It has not proved successful.

Stereographic Projection, that projection of the sphere which is represented on the plane of one of its great circles, the eye being situated at the pole of that great circle. All circles are projected either into straight lines or circles, and the angle made by two circles meeting on the globe is the same as that made by the projections of those circles. It is the projection generally employed in ordinary atlases. The distortion in the form of countries on the plane surface is very slight.

Stereopticon, a magic lantern having two objective tubes that can be focused on the same part of a screen, and by the alternate projection of pictures from the separate tubes produce the well-known phenomenon of "dissolving views." The stereopticon has been successfully adapted to the projection of instantaneous photographs of moving objects, producing the same effect of motion on the screen as observed in the kinetoscope. See Biograph.

Stereoscope, a simple and popular optical contrivance, by which two flat slightly dissimilar pictures of an object are fused into one image, having the actual appearance of relief. The stereoscope is constructed in accordance with the visual phenomena which convey to the mind impressions of the relative forms and positions of an object. When a near object having three dimensions is looked at, a different perspective representation of it is seen by each eye; in other words, there is distinct binocular parallax. Certain parts are seen by the right eye, the left being closed, that are invisible to the left eye, the right being closed, and vice versa, and the relative positions of the portions visible to each eye in succession differ. These two visual impressions are simultaneously perceived by both eyes, and are combined into one image, producing the impression of perspective and relief. If, then, truthful right-and-left monocular pictures of any object be so presented to the two eyes that the optic axes, when directed to them, shall converge at the same angle as when directed to the object itself, a solid image will be seen. This is effected with the stereoscope, a reflecting form of which was invented by Professor Wheatstone in 1838. It is constructed so that the two dissimilar pictures are reflected to the eyes from two small plane mirrors placed at right angles, the faces being toward the observer. Subsequently Sir David Brewster invented the refracting or lenticular stereoscope, based on the refractive properties of semidouble convex lenses; and this instrument, of which there are numerous forms, is now in general use. Convex lenses magnify the pictures besides producing a stereoscopic effect. Photography greatly assists the stereoscope in providing perfectly accurate right-and-left monocular views, which are taken simultaneously on a plate in a twin camera. Sometimes, in the case of objects which from their distance have no sensible binocular parallax, photographs are taken from two points considerably apart; and when such views are combined in the stereoscope, the effect of relief is greatly exaggerated. Several modifications of the reflecting stereoscope are distinguished by the names pseudoscope, iconoscope, telestereoscope, and polistereoscope, the last being an apparatus which serves the purposes of all the others.

Stereoscopic Slide, a slip of cardboard on which are mounted side by side two photographs of the same scene or object. Theoretically, these photographs should be taken by similar lenses from points of view separated by a space equal to the distance between the human eyes, but in practice — especially in dealing with architectural groups — the space is increased in order to procure a greater effect.

Stereotrope, an instrument by which an object is perceived as if in motion, and with an appearance of solidity or relief as in nature. It consists of a series of stereoscopic pictures, generally eight, of an object in the successive positions it assumes in completing any motion, affixed to an octagonal drum, revolving under an ordinary lenticular stereoscope, and viewed through a solid cylinder pierced in the entire length by two apertures which make four revolutions for one of the picture drum. The observer thus sees the object constantly in one place, but its parts appparently in motion, and in solid and natural relief.

Stereotype, fixed type; hence a plate cast from a plaster or papier-maché mold, on which is a facsimile of the page of type as set up by the compositor, and which, when fitted to a block, may be used under the press, exactly as movable type. The

alloy for stereotype plates is composed of the same materials as ordinary type metal. An alloy composed of 500 lead, 300 tin, and 225 antimony, has, on account of its hardness, been pronounced the best for stereotype plates. The original, or plaster process of stereotyping, was invented by William Ged, a goldsmith of Edinburgh, who was employed by the University of Oxford, in 1731, to manufacture plates for Bibles and prayer books. In this process the type is set up in the usual way, except that shoulder-high spaces and quadrats are employed. The face of the form is thinly and evenly oiled with a brush, and it is surrounded by a rectangular frame termed a flask. Plaster of Paris mixed with water is then poured on it, forming a mold corresponding to the face of the form. When this has sufficiently hardened, it is dried in an oven till all the moisture is driven off, and it is then used as a mold to obtain a facsimile in stereotype metal of the form of type.

This system, however, has been to a great extent superseded by the papier-maché process, invented by Wilson, in Scotland, in 1823. This is a very expeditious process, and is generally used on the daily papers of large circulation. A paper matrix is formed by spreading paste over a sheet of moderately thick unsized paper, and covering it with successive sheets of tissue paper, each carefully patted down smooth, and the pack then saturated. The face of the type is oiled, the face of the paper laid on the type, and then the matrix dabbed by a beating brush from the back, so as to drive the soft paper into all the interstices between the letters of the form. A reinforce sheet of damp matrix paper is laid on the back of the matrix, and the matrix beaten again, to perfect the impression and establish a junction. The hollows in the back are filled up, and the matrix, after being covered with a double thickness of blanket, is placed in a press and subjected to strong pressure over a steam chest, the heat of which dries the matrix. The press is unscrewed, the matrix removed, its edges pared, and it is warmed on the molding press. The matrix is then placed in the previously-heated iron casting mold; a casting gauge to determine the thickness of the stereotype is placed round three sides of the matrix, the other side being left open for a gate, at which the molten metal is poured in. The cover is screwed tight, the mold tipped to bring the mouth up, and the metal poured in. When the metal is set, the mold is opened and the matrix removed. The plate is then trimmed and otherwise prepared in the usual manner. For rotary printing machines both matrix and plate form the segment of a circle to enable the plate to fit on the impression cylinder. See ELECTROTYPE.

Sterility, the quality or state of being sterile; barrenness. According to Darwin, sterility in animals and plants may be constitutional or accidental and often arises from changed conditions of life. Thus most raptorial birds from the tropics do not lay fertile eggs in captivity in temperate climates, and many exotic plants brought to England have worthless pollen. Sometimes a little more or less water will decide whether or not a plant will seed. There are various degrees of sterility in first crosses and hybrids; occasionally there is an absence of some element necessary to reproduction, thus in the more sterile kinds of hybrid rhododendrons pollen is wanting.

Sterilized Milk, milk which has been subjected to a process that destroys the bacteria causing lactic or butyric acid fermentation and the germs of disease. Experiments have been made with chemical sterilizers, but these must be used in quantities so large as to be injurious. A freezing temperature checks the development of bacteria, but cannot be relied on, in every instance, to destroy them. A boiling temperature (212° F.) is believed to kill all germs in an hour; but "Pasteurization," which requires only 167°, is generally sufficient, though it will not kill the bacillus of tuberculosis. Superheated steam is preferable to boiling water, in sterilization. Among the best known forms of apparatus are those of Soxhlet, Seibert, and Arnold. Sterilization is now largely carried on under the supervision of State and county boards of health.

Sterling, originally a substantive, "a coin of true weight," as applied at first to the English penny, then to all current coin. The adjective is now used of all the money of the United Kingdom, and has long been a synonym for pure and genuine.

Sterling, a city in Whiteside co., Ill.; on the Rock river, and on the Burlington Route, and the Chicago and Northwestern railroads; 110 miles W. of Chicago. The city has high schools, a public library, electric lights, waterworks, National and other banks, and daily and weekly newspapers. It has manufactures of farming implements, flour, school furniture, carriages, caskets, pumps, sash and door works, etc. Here also are located the Sterling Iron Works, a large distillery, foundries, and machine shops. The assessed property valuation is about $1,400,000. Pop. (1900) 6,309; (1910) 7,467.

Sterling, John, a British author; born in Kames Castle, Island of Bute, Scotland, July 20, 1806. He was the son of Edward Sterling, editor of the London "Times"; received his education at Glasgow and Cambridge Universities; became for a short time editor of the "Athenæum"; took orders in the Church and was ordained

(1834) curate to Julius Hare at Hurstmonceux. Among his works are: "Arthur Coningsby," a novel (1883); "The Onyx Ring"; "Minor Poems" (1839); "The Election," a poem, (1841); "Strafford," a drama, (1843); and "Essays and Tales." He is now known chiefly as the subject of Carlyle's "Life of John Sterling" (1851), which was in some sort a reply to the "Memoir of Sterling" written by Archdeacon Hare. He died in Ventnor, Isle of Wight, England, Sept. 18, 1844.

Sterling Gold, gold having the value or fineness of the standard established by the British government. It consists of 22 parts (called carats) of pure gold and two parts of alloy, either silver or copper. But fancy gold articles may be manufactured with only 15, 12, or even 9 carats of gold and the rest alloy. One pound Troy of standard gold is coined into 46 sovereigns. There remains a small fraction over; but 46 sovereigns will do for a pound Troy weight. A sovereign weighs 5 dwts. 3.27447 grains; but 5 dwts. 2½ grains is a legal tender. The Bank of England gives 46l. 14s. 6d. a pound for gold.

Sterling Silver, silver having the value or fineness of the standard established by the British government. It consists of 37 parts of silver and 3 of copper. One pound Troy of silver is coined in 66 shillings. A shilling from the mint weighs 15.27272 grains. The standard value of silver is very variable. In 1870 it was worth at the Bank of England 5s. an ounce. In 1875 about 4s. In 1878 it was 4s. 2d. In 1890 it varied from 4s. to 4s. 4d. See BIMETALLISM.

Stern, Daniel, pseudonym of MARIE CATHERINE SOPHIE DE FLAVIGNY, COMTESSE D'AGOULT (dä-gö'), a famous French writer; born in Frankfort-on-the-Main, Germany, Dec. 31, 1805. One of her three daughters, that by Franz Liszt, married Von Bülow, and subsequently Richard Wagner. Her works include: "Moral and Political Essays" (1849); "History of the Revolution of 1848" (1851); and "Nélida," an autobiographical romance. She died in Paris March 5, 1876.

Sterna, in ornithology, the tern; a cosmopolitan genus of *Laridæ*, and sub-family *Sternin*æ. Bill longer than head, nearly straight, compressed; nostrils near middle of the beak, pierced longitudinally, pervious; legs slender, toes four, the three in front webbed; wings long, pointed; tail distinctly pointed. *S. anglica* (the gull-billed), *S. caspia* (the Caspian), *S. cantiaca* (the Sandwich), *S. dougalli* (the roseate), *S. fluviatilis*, formerly *S. hirundo* (the common), *S. macrura* (the Arctic), *S. minuta* (the lesser), and *S. fuliginosa* (the sooty tern) are the best known visitors. The species formerly known as *S. fissipes* (black tern), *S. leucoptera* (white winged black tern), and *S. leucoprarcia* (whiskered tern) are now generally regarded as constituting the genus *Hydrochelidon*. They are all European birds, and are distinguished from most of the other terns by their shorter bills, slightly forked tails, and smaller webs to the feet.

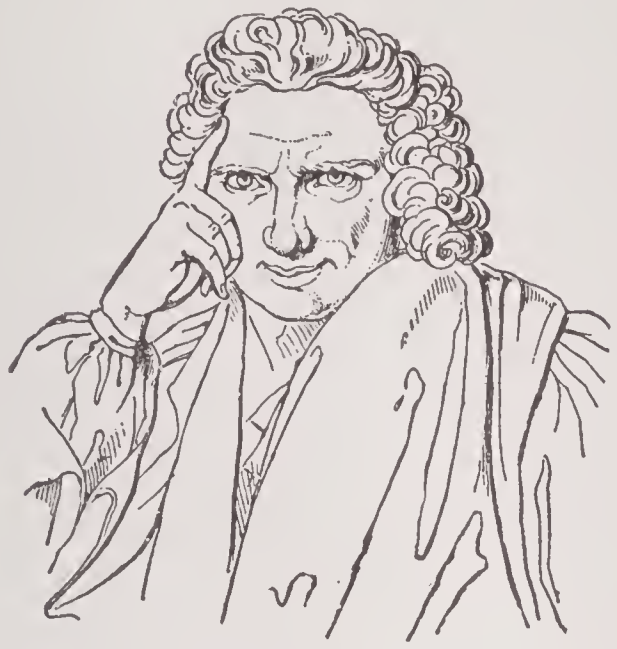
Sternberg, George Miller, an American surgeon; born in Otsego co., N. Y., June 8, 1838; was graduated at the College of Physicians and Surgeons in New York city in 1860. He was appointed an assistant surgeon in the army in 1861; promoted captain and assistant surgeon May 28, 1866; major, Dec. 1, 1875; lieutenant-colonel Jan. 2, 1891; and Brigadier-General and Surgeon-General May 30, 1893. During the Civil War he served in the Army of the Potomac and in the Department of the Gulf. Afterward he served through several cholera and yellow fever epidemics, and in 1898 at the outbreak of the American-Spanish War he planned the army hospital train, and had charge of the medical service of the army. He was secretary of the Havana Yellow Fever Commission in 1879; president of the American Medical Association in 1898; and the author of "Photo-Micrographs, and How to Make Them"; "Manual of Bacteriology." "Immunity, Protective Inoculations, and Serum-Therapy"; etc.

Sternbergia, in botany a genus of *Amaryllea*. *S. lutea*, which resembles an autumnal crocus, is cultivated in gardens. In palæobotany, a pseudo-genus of fossil plants. It is a cylindrical stem with transverse markings, now known to be the cast of the pith cylinder of some tree; one so-called species from the carboniferous rocks.

Sterndale, Robert Armitage, an English naturalist; was the author of "Seonee; or, Camp-Life on the Satpura Range" (1877); "The Afghan Knife" (1879); "A Natural History of the Mammalia of India," etc. (1884); "Denizens of the Jungles."

Sterne, Laurence, an English humorist; born in Clonmel, Ireland, Nov. 24, 1713. He lived for part of his boyhood in Ireland, was put to school at Halifax, England, in 1722, whence he removed to Jesus College, Cambridge. He took his degree of M. A. in 1740; received holy orders; obtained the living of Sutton, in Yorkshire, and also a prebend of York. In 1759 appeared the two first volumes of his longest work, "The Life and Opinions of Tristram Shandy," which gained instant popularity. A third and fourth volume appeared in 1761, a fifth and sixth in 1762, a seventh and eighth in 1764, and a ninth, singly, in 1766. From the publication of the first volumes of "Tristram Shandy," Sterne lived mostly in London or on the Continent, for a considerable time apart from his wife and daughter, who also were not with him at

his death. His other writings are "A Sentimental Journey through France and Italy" (1768), and a number of sermons,



LAURENCE STERNE.

besides letters published after his death. He died in London March 18, 1768.

Sterne, Stuart. See BLOEDE, GERTRUDE.

Sterner, Albert Edward, an American artist; born in London, England, March 8, 1863; was educated at Julien's Academy and the Ecole des Beaux Arts in Paris; and came to the United States in 1881. He was employed as a scene painter and lithographer in Chicago, Ill., in 1881–1885, when he went to New York city and there opened a studio. He was the illustrator of George W. Curtis' "Prue and I"; "Coppee's Tales"; "Poe's Works"; and other books and magazines.

Sternhold, Thomas, an English writer, one of the authors of the version of psalms formerly attached to the Book of Common Prayer; born near Blakency, England, about 1500. He was Groom of the Robes to Henry VIII. and Edward VI. The complete psalms appeared in 1562, and for nearly two centuries after formed almost the whole hymnody of the Church of England. The title under which it was annexed to the Book of Common Prayer was: "The Whole Book of Psalms, collected into English Metre by T. Sternhold, J. Hopkins, and others, conferred with the Ebreu; with apt Notes to sing them withal." Forty psalms bear the name of Sternhold, and 60 that of Hopkins. He died in August, 1549.

Sternoptychidæ, in ichthyology, a family of *Physostomi;* pelagic and deep-sea fishes of small size. Body naked or covered with thin, deciduous scales; gill opening very wide; air-bladder simple, if present; adipose fin generally rudimentary; series of phosphorescent bodies along the lower parts. The eggs are inclosed in the sacs of the ovarium, and excluded by oviducts. Günther enumerates nine genera.

Sternum, the breast bone; in man, the flat bone, occupying the front of the chest, and formed by the meeting of the visceral arches. It is flattened from before backward, and presents a slight vertical curve with the convexity in front. It is divided into the manubrium or presternum, the mesosternum, and the ensiform or xiphoid process of metasternum. All mammals and birds possess a sternum, and the presence or absence of a keel on that bone in birds is used as a means of classification. Fishes, amphibians, and ophidians have no sternum, and in saurians the broad portion is generally expanded. Some suppose that the plastron of the *Chelonia* is a highly-developed sternum; others hold that it is a mere integumentary ossification. The name sternum is also given to the plate on each segment of the breast of a crustacean and an arachnidan, but these are integumentary. and have no relation to a true sternum.

Stesichorus, one of the nine great lyric poets of antiquity; is said to have been born in 632 B. C., either in Himera in Sicily, or Metaurus in Magna Græcia, and to have died about 556, but nothing certain is known concerning him. His own name, Tisias, he changed to Stesichorus ("leader of choirs") as the inventor of strophe, antistrophe, and epode, and with his predecessor Alcman he stands at the head of Dorian choral poets. His fragments include erotic, pastoral, and mythological pieces, fables and elegies, hymns, pæans, and epithalamia, and are collected in Bergk's "Poeta Lyrici Græci."

Stethnometer, an instrument for measuring the external movements in the walls of the chest during respiration, as a means of diagnosis in thoracic diseases. In one form a cord is extended round the chest, and its extension as the thorax is expanded, works an index finger on a dial plate. It thus becomes a measure of the expansive power and capacity of the lungs.

Stethoscope, an instrument employed in auscultation. It was invented by Laennec, who at first used a roll of blotting paper for the purpose of concentrating and conveying sound to the ear; but, according to Tyndall, the philosophy of the stethoscope was enunciated by Dr. Robert Hooke (1635–1702). The simplest form of stethoscope consists of a cylindrical stem of porous wood, as cedar or deal, some seven or eight inches long, expanding at one end into a circular, funnel-shaped aperture from two and a half to three inches in diameter, which is applied to the chest, while the other end terminates in a smaller aperture, which is placed in the ear of the physician. Flexible stethoscopes of rubber are also employed; these are sometimes furnished with two ear tubes, so that the sounds may be perceived by both ears. The chief use of

the stethoscope is to enable the medical man to sound small portions of lung at a time, and so detect more correctly than by the unaided ear the exact seat of disease.

Stettin, the capital of Pomerania and one of the chief seaports of Germany; on the Oder, 17 miles from its entrance into the Stettiner Haff, 30 miles from the Baltic Sea, and about 83 miles from Berlin. The principal part is built on the left bank of the river, while on the right bank are the suburbs of Lastadie and Silberwiese, connection being maintained by several bridges, one of which is a large railway swing bridge. The town has greatly expanded since the removal of the extensive fortifications by which it was surrounded. Among its more notable features are the old royal palace, now occupied as government buildings, the new town hall, two monumental gateways, several Gothic churches, exchange, theater, etc. Its industries, which are numerous and important, include iron founding, ship building, machine making (one ship building and engineering work employs 4,000 or 5,000 hands), the manufacture of chemicals, cement, sugar, soap, candles, chocolate, etc. It has been a port of some importance since the 12th century. Pop. (1905) 224,119.

Steuben, Frederic William Augustus, Baron, an American military officer; born in Magdeburg, Prussia, Nov. 15, 1730. He came to America in 1777 and his offer of service was readily accepted. Having received the appointment of inspector-general, with the rank of Major-General, he proved of efficient service to the American army in establishing a system of discipline and tactics, a perfect knowledge of which he had acquired as an officer under Frederick the Great. He spent his whole fortune in clothing his men and gave his last dollar to the soldiers. Congress made tardy reparation, and in 1790 voted him an annuity of $2,500 and a township of land in the State of New York, both of which he divided with his fellow officers. He died on his estate near Utica, N. Y., Nov. 28, 1794. In 1870 the corner stone of a monument to his memory was laid at the Schützen Park.

Steubenville, a city and county-seat of Jefferson co., O.; on the Wheeling and Lake Erie, the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Pennsylvania railroads; 43 miles W. of Pittsburg, Pa. It is near a rich bituminous coal region, and is in the heart of an agricultural section. Here are a female seminary, public libraries, waterworks, electric lights, high school, National and private banks, and daily and weekly newspapers. The city has a large coal industry, and manufactories of glass, steel, machinery, pottery, paper, flour, boilers, fire and paving brick, sewer pipe, etc., and an assessed property valuation exceeding $5,600,000. Pop. (1890) 13,394; (1900) 14,349; (1910) 22,391.

Stevens, Abel, an American clergyman; born in Philadelphia Jan. 19, 1815. He was editor of the "Methodist" in 1865–1874; subsequently traveled extensively, and settled in Geneva, Switzerland. He wrote many denominational books, among them: "Essay on Church Policy" (1847); "Memorials of the Introduction of Methodism into the Eastern States" (1847–1852); "History of the Religious Movement of the Eighteenth Century called Methodism" (3 vols. 1858–1861); "History of the Methodist Episcopal Church in the United States" (4 vols. 1864–1867), a standard authority on this subject. He wrote also a German translation (1867); "The Centenary of American Methodism" (1865); "The Women of Methodism," etc. (1866); "Madame de Staël" (2 vols. 1881); "Character Sketches" (1882); "Christian Work" (1882); "Tales from the Parsonage"; besides several volumes of memoirs. He died in San José, Cal., Sept. 12, 1897.

Stevens, Alfred George, an English sculptor; born in Blandford, Dorset, England, in January (baptized 28th), 1818. When he was helping his father, a painter, his talent attracted the attention of certain gentlemen, who in 1833 sent him to Italy. There he remained nearly nine years studying painting, though part of the time he assisted Thorwaldsen, the sculptor, in his studio. Three years after his return home Stevens was appointed (1845) teacher of architectural drawing in the School of Design, Somerset House, London; but he held the post only three years. During the next 10 years or so from that date he was busily engaged in designing and decorating, in which he displayed the highest genius and taste. He designed in all sorts of materials and for many different purposes — in silver, bronze, iron, marble, and for furniture, churches, porcelain, mantelpieces. From 1856 he labored at the great achievement of his life, and one of the finest pieces of modeling in England in the 19th century, the monument of Wellington for St. Paul's Cathedral; but owing to the greatness of his conception and plan, the inadequacy of means and other difficulties, it was not completed at his death at Haverstock Hill, London, May 1, 1875. It was not till 1892 that steps were taken to remove this magnificent monument from the side chapel where it was half-hidden, to the place for which it was originally intended.

Stevens, Benjamin Franklin, an American bibliographer; born in Barnet, Vt., Feb. 19, 1833; was engaged for more than 30 years in making a manuscript chronological and alphabetical catalogue index of American papers in many archives in England, Holland and Spain; made fac-

similes of many such manuscripts; and devoted much time to the compilation of unpublished manuscript papers pertaining to the American Revolution. He was a Fellow of the Society of Antiquarians, a member of the Société d'Histoire Diplomatique; honorary member of the Connecticut, Maryland, Minnesota, New Hampshire, and Vermont Historical Societies, and was intimately associated with other similar organizations. He died March 5, 1902.

Stevens, Henry, an American bibliographer; born in Barnet, Vt., Aug. 24, 1819; was graduated at Yale College in 1843; became interested in the Colonial history of the United States; went to England in search of American historical data in 1845, and there succeeded in gathering an immense amount of valuable material relating to the early history of the United States. His publications include: "Catalogue of a Library of Works Relating to America"; "Catalogue of American Books in the Library of the British Museum"; "Historical and Geographical Notes on the Earliest Discoveries in America"; etc. He died in South Hampstead, England, Feb. 28, 1886.

Stevens, John Austin, an American historian; born in New York city, Jan. 21, 1827. He was secretary of the Chamber of Commerce, librarian of the New York Historical Society, and has made a special study of American history. He founded and for many years conducted the "Magazine of American History." His works include: "The Valley of the Rio Grande" (1864); "Colonial Records of the New York Chamber of Commerce" (1867); "The Expedition of Lafayette against Arnold" (1878); "Life of Albert Gallatin" (1883); and others. He died June 16, 1910.

Stevens, Thaddeus, an American statesman; born in Danville, Vt., April 4, 1792; was graduated at Dartmouth, College in 1814; studied law and was admitted to the Maryland bar. He kept aloof from politics till the election of Jackson in 1828, when he became an active member of the Whig party. In 1833 and for several succeeding years, he was a member of the Pennsylvania Legislature and became distinguished by his opposition to slavery. He was appointed a canal commissioner in 1838, and rendered important services to the State in the promotion of its system of internal improvements. Subsequently he removed to Lancaster, and for six years devoted himself to the practice of his profession. But in 1848 and again in 1850 he was elected to Congress, where he maintained strong opposition to the Fugitive-Slave Law, the Kansas-Nebraska bill, and all measures favoring the independence of the South. In 1858 he was again elected to Congress and retained his seat till his death, in Washington, D. C., Aug. 11, 1868.

Stevens Institute of Technology, an educational non-sectarian institution in Hoboken, N. J.; founded by Edwin A. Stevens in 1870; has endowment exceeding $880,000; grounds and buildings valued at over $750,000; scientific apparatus, etc., $100,000; volumes in the library, about 10,000; average number of faculty, 35; average student attendance, 390; graduates, over 1,500.

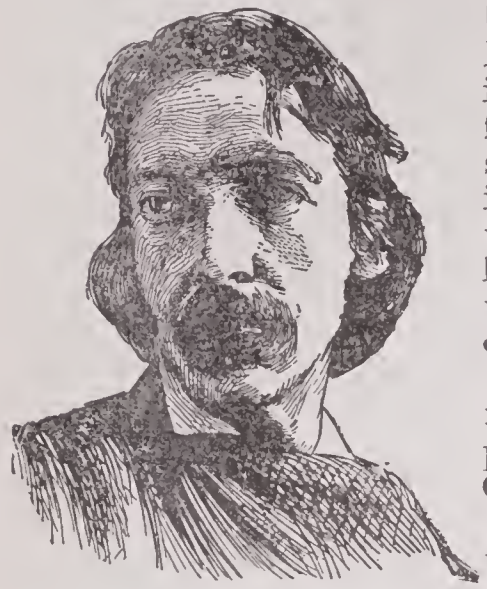
Stevenson, Adlai Ewing, an American statesman; born in Christian co., Ky., Oct. 23, 1835; early took an active part in politics as a Democrat, and in 1875–1877 and 1879–1881 represented Illinois in the National House of Representatives. In 1885 was appointed first assistant postmaster-general, and after the renomination of Grover Cleveland in 1892 was chosen the candidate for the vice-presidency. The Democratic candidates were elected, and after the expiration of his term he was appointed a member of the American commission to visit Europe and endeavor to secure the adoption of international bimetallism.

Stevenson, Edward Irenæus, an American journalist; born in Madison, N. J., in 1858. He was editorially connected with the New York "Independent" after 1881, and also with "Harper's Weekly" and several musical journals. He published: "White Cockades"; "Janus," reprinted as "A Matter of Temperament," a musical novel; "Left to Themselves," reprinted as "Philip and Gerald"; "Mrs. Dee's Encore"; "The Square of Sevens."

Stevenson, Robert, a Scotch engineer; born in Glasgow, Scotland, June 8, 1772. His father died during his infancy; and his mother having (1786) married Thomas Smith, the first engineer of the Lighthouse Board, young Stevenson was led to the study of engineering. In 1796 he succeeded his stepfather as engineer and inspector of lighthouses; and during his 47 years' tenure of that office he planned and constructed 23 lighthouses round the Scotch coasts, employing the catoptric system of illumination, and his valuable invention of "intermittent" and "flashing" lights. The most remarkable of these erections was that on the Bell Rock. In 1814 Stevenson was accompanied in his tour of inspection by Sir Walter Scott. Stevenson was also in great request as a consulting engineer in the matter of roads, bridges, harbors, canals, and railways, introduced many improvements in their construction, and occasionally coöperated with Rennie, Telford, and others. He wrote four volumes of professional printed reports, a large work on the Bell Rock lighthouse, some articles in

the "Encyclopædia Britannica" and in the "Edinburgh Encyclopædia." He died in Edinburgh July 12, 1850.

Stevenson, Robert Louis Balfour, a British author; son of Robert Stevenson; born in Edinburgh, Scotland, Nov. 13, 1850; educated at the University of Edinburgh, was intended for his father's profession, but studied law; in 1873 went abroad for his health; wrote for periodicals till 1878, when his first book appeared; visited California in 1879; spent the winter of 1887–1888 in the Adirondacks; cruised in the Pacific; bought a tract of land ("Vailima" or "Five Streams") in Samoa, where he made his home. He published: "An Inland Voyage" (1878); "Edinburgh: Picturesque Notes" (1878); "Travels with a Donkey in the Cévennes" (1879); "Virginibus Puerisque, and Other Papers" (1881); "Familiar Studies of Men and Books" (1882); "New Arabian Nights" (1882); "Treasure Island" (1883); "The Silverado Squatters" (1883); "The Dynamiter: More New Arabian Nights" (1885), with Mrs. Stevenson; "A Child's Garden of Verse" (1885); "Prince Otto" (1885); "The Strange Case of Dr. Jekyll and Mr. Hyde" (1886); "Kidnapped" (1886); "Underwoods" (1887); "The Merry Men and Other Tales" (1887); "Memoirs and Portraits" (1887); "The Black Arrow" (1888); "The Master of Ballantrae" (1889); "Ballads" (1891); "The Wrecker" (1891–1892); "A Foot-Note to History: Eight Years of Trouble in Samoa" (1892); "David Balfour" (1893); "Island Nights' Entertainments" (1893); "The Ebb Tide" (1894); "Weir of Hermiston" and "St. Ives" (1895–1896), the last two left not quite complete. He died in Vailima, near Apia, Samoa, Dec. 3, 1894.



ROBERT L. STEVENSON.

Stevens Point, a city and county-seat of Portage co., Wis.; on the Wisconsin river, and on the Wisconsin Central and the Green Bay and Western railroads; 63 miles W. of Appleton. It contains gas and electric lights, National and State banks, and daily and weekly newspapers. It has a large lumbering trade, especially in pine. Here are shops of the Wisconsin Central railroad, and numerous foundries, flour, planing, saw, and shingle mills. The assessed property valuation exceeds $3,000,000. Pop. (1890) 7,896; (1900) 9,524; (1910) 8,692.

Stevia (named after Peter James Esteve, M. D., Professor of Botany at Valencia), a genus of *Vernoniaceæ* akin to ageratum. Pretty autumnal flowering plants from America, with purple, red, pink, white or violet flowers. About 36 species are cultivated in gardens, where they are sometimes used as border plants, but require the protection of a frame in severe weather.

Steward, in the original sense, one who looked after the domestic animals and gave them their food; hence, one who provides for his master's table, and, generally, one who superintends household affairs for another. A person employed on a large estate or establishment, or in a family of consequence and wealth, to manage the domestic affairs, superintend the other servants, collect rents, keep the accounts, etc. An officer in a college who provides food for the students and superintends the affairs of the kitchen. An official on a vessel, whose duty it is to distribute provisions to the officers and men. In passenger ships, a man who superintends the distribution of provisions and liquors, waits at table, etc. A fiscal agent of certain bodies; as, the recording steward of a congregation of Methodists.

An English officer of state, as the Lord High Steward, the Steward of the Household, etc. The Lord High Steward was the greatest officer of state in England. The office was anciently the inheritance of the Earls of Leicester, till it was forfeited by Simon de Montfort to Henry III., at the end of whose reign it was abolished as a permanent office. A Lord High Steward is now only appointed for particular occasions, as a coronation or the trial of a peer. In the former case he has to arrange questions of precedence; in the latter to preside over the House of Lords. His office ceases with the business for which it was required. The Steward of the Household is an officer of the royal household, who presides over the court known as the Board of Green Cloth, which has the supervision of the household expenses and accounts, the purveyance of provisions, payment for them, etc. He appoints the royal tradesmen, and selects and has authority over all servants of the household, except those of the chamber, chapel, and stables. In Scotland, an officer appointed by the sovereign over certain lands belonging to himself, having the same proper jurisdiction as a regality; also, the deputy of a lord of regality.

The Steward (or High Steward) of Scotland is an ancient chief officer of the crown, of the highest dignity and trust. He had not only the administration of the crown revenues, but the chief oversight of all the affairs of the household, and the privilege

Stewart

of the first place in the army, next to the king, in battle.

Stewart, Alexander Peter, an American military officer; born in Rogersville, Tenn., Oct. 2, 1821; was graduated at the

ALEXANDER P. STEWART.

United States Military Academy in 1842; assistant Professor of Mathematics there in 1843–1845; held the same chair in Cumberland University in 1845–1849, and at Nashville University in 1854–1855. During the Civil War he served under Generals Bragg, Johnston, Hood, and others in the Confederate army. In 1868 he became Professor of Mathematics and Natural Philosophy and chancellor of the University of Mississippi. He died Aug. 30, 1908.

Stewart, Alexander Turney, an American merchant; born near Belfast, Ireland, Oct. 12, 1803; came to the United States in 1823 and engaged in teaching. In 1825 he began, in New York city, a dry-goods business which gradually expanded into one of the largest mercantile concerns in the world. He was a donor of large sums of money to various charitable institutions, and was active in many philanthropic undertakings. He died in New York, April 10, 1876, and was buried in St. Mark's churchyard, from which his remains were stolen on Nov. 7, 1878. It was afterward stated that the remains had been recovered and deposited in the mausoleum of the Cathedral of the Incarnation, erected by Mrs. Stewart in memory of her husband at Garden City, Long Island.

Stewart, Balfour, a Scotch physicist; born in Edinburgh Nov. 1, 1828. He studied at both St. Andrews and Edinburgh Universities, but in 1846 entered on a commercial career. Seven years later he forsook business, returned from Australia to Edinburgh, and became assistant to Professor Forbes. In 1859 he was appointed director of the Kew Observatory, and in 1870 Professor of Physics at Owens College, Manchester. He made his first reputation by his work on "Radiant Heat" (1858), by which he established the equality of the emissive and absorptive powers of bodies. He is rightly regarded as one of the founders of the method of spectrum analysis, of which the complete theory was given by Kirchhoff a little later. In connection with his work on radiant heat the experiments (in conjunction with Professor Tait) on the heating of a rotating disk in vacuo (1865–1878) should be mentioned, as should also his remarks on the effect of relative motion on radiation. His other labors were chiefly meteorological, his name being specially associated with such subjects as the relation between sun-spots and temperature and magnetic changes, terrestrial magnetism, and the daily ranges of the meteorological elements. Particularly valuable are his numerous papers on terrestrial magnetism. As a writer of text-books on physics he earned a high reputation, the "Treatise on Heat" (1866; 5th ed. 1888); the "Elements of Physics" (1870; 4th ed. 1891); and the Conservation of Energy" (1873; 7th ed. 1887) being all excellent works, especially the first. Very concise in statement and suggestive in treatment is his contribution on terrestrial magnetism to the "Encyclopædia Britannica" (article "Meteorology"). With Professor Tait he published in 1875 "The Unseen Universe, or Physical Speculations on a Future State," a book which had a phenomenal reception and passed rapidly through several editions (17th ed. 1890). He died, Dec. 19, 1887, near Drogheda, Ireland.

Stewart, Charles, an American naval officer; born in Philadelphia, Pa., July 28, 1778; entered the navy in 1789 as lieutenant of the frigate "United States," in which capacity he was employed in the West Indies against French privateers. As commander of the brig "Siren" he participated in the naval operations of 1804 against Tripoli and aided in the destruction of the "Philadelphia." In 1813 he took command of the "Constitution," and in December sailed from Boston on a cruise to the coast of Guiana and the Windward Islands, which resulted in the capture of the British schooner "Picton" and several merchant vessels. A year later he sailed in the same ship on a second cruise, and on Feb. 20, 1815, captured the British ship "Cyane," mounting 34 guns, and the sloop of war "Levant," mounting 21 guns. He commanded a squadron in the Mediterranean in 1816–1820, and in the Pacific in 1821–1823; served on the board of navy commissioners; commanded the home squadron; and had charge of the naval station at Philadelphia. In 1857 he was placed on the retired list, but resumed service in 1859 as commander

of the Philadelphia navy yard, and on July 16, 1862, was made rear-admiral on the retired list. He died in Bordentown, N. J., Nov. 7, 1869.

Stewart, Sir Donald Martin, a British military officer; born near Forres, Scotland, March 21, 1824; educated at Aberdeen University; entered the Bengal Staff Corps in 1840; took part in the suppression of the Indian mutiny in 1857, and in the Abyssinian expedition of 1867–1868. He commanded the Kandahar column in the Afghan campaign of 1878–1880, and marched with the field force from Kandahar to Kabul, defeating the Afghans at Ahmed Kheyl. He was commander-in-chief in India in 1881–1885, and initiated the strategic series of connected fortifications and supply bases commanding the Northwest frontier. He afterward became a member of the Indian Council. In 1894 he was promoted field-marshal, and after 1895 was governor of Chelsea Hospital. He died in Algiers March 26, 1900.

Stewart, Dugald, a Scotch philosopher; born in Edinburgh, Scotland, Nov. 22, 1753, was educated in Edinburgh and attended the lectures of Dr. Reid in Glasgow. In 1772 he began to assist his father who was Professor of Mathematics in Edinburgh University, being appointed joint-professor three years afterward. In 1778 he agreed to lecture also as a substitute for Adam Ferguson in the chair of moral philosophy, and in 1785 when the latter resigned, Dugald Stewart received the appointment. Besides holding this position for a quarter of a century, from which he spread a fine intellectual and moral influence, Stewart was the author of "Elements of the Philosophy of the Human Mind" (1792–1827), "Outlines of Moral Philosophy" (1793), and accounts of the "Life and Writings of Adam Smith," of Dr. Robertson, and of Dr. Reid. He died in 1828.

Stewart, Matthew, a Scotch mathematician; born in Rothesay, Bute, Scotland, in 1717; studied at the University of Glasgow and at the University of Edinburgh, and from 1747 to 1772 lectured there. He published: "General Theorems of Considerable Use in the Higher Parts of Mathematics" (1746); "Tracts Physical and Mathematical" (1761); and "Geometrical Propositions Demonstrated by the Ancient Method" (1763). He died Jan. 23, 1785.

Stewart Islands, a small group of islands in the Solomon Archipelago, Pacific Ocean.

Stewart Island, an island of New Zealand, S. of South Island; area, 655 square miles.

Stewartry, in Scotland, a division of the crown lands formerly under the jurisdiction of a steward appointed by the king. Besides the civil powers of a sheriff, the steward exercised an extended criminal jurisdiction but by an act of Victoria, the names steward and steward clerk, etc., were abolished from the statutes in favor of sheriff, sheriff clerk, etc. The only trace still remaining of the older jurisdiction is in the designation of Kirkcudbright as a stewartry instead of a county or shire. While the territory of Galloway, comprising Wigton and Kirkcudbright, was still in a strict sense only a tributary dependency of Scotland, it retained its old Celtic proprietary and its peculiar laws and usages. Ruled for a long period by its own dynastic lords, among the most powerful under the Scotch crown, it eventually fell to the Comyns who were overthrown by Bruce. About this date (1306) it would seem that Eastern and Central Galloway were formed into the existing stewartrys, while Western Galloway or Wigton had already been formed into a shire. When in 1747 heritable jurisdiction was removed, the stewartry, freed from certain regalities and baronies, was placed under a steward depute, whose functions were almost identical with those of a sheriff deputy. A humbler survival of the old proprietary is seen in the name common in Scotland of land steward — the grieve or bailiff of a farm or estate.

Stewing, a mode of cooking by which the meat is first covered with cold water, gently heated, and then kept slowly simmering below the boiling point till it is thoroughly cooked. If the stewing is not accomplished slowly the meat will be dry and tough.

Steyn, Martinus Theunis, a Boer statesman; born in Winburg, Orange Free State, Oct. 2, 1857; worked on his father's

MARTINUS T. STEYN.

farm till 1876, when he went to England to study. He returned to Africa in 1882 and practised law in Bloemfontein till 1889,

when he was made second puisne judge and state attorney. Later he became first puisne judge, and in 1896 was chosen president of the Orange Free State. For a number of years before his election to the presidency he had been in communication with President Krüger and their close relations finally resulted in the union of the interests of the Orange Free State and the Transvaal in their struggle against Great Britain. When the Boer War broke out he took the field in person with the Free State troops.

Sthenic, a Greek word meaning strength; in pathology a condition arising from accumulated excitability; used by the founder of the Brunonian system for the increased tone, vigor, or vitality which certain constitutions possess temporarily or permanently, and which creates in them a liability to a class of diseases not likely to affect an asthenic or feeble constitution. Thus, what looks like rude health, sometimes precedes and perpares the way for an attack of rheumatism. Cullen called it inflammatory diathesis.

Stibiconite, a massive compact mineral, occurring also in a pulverulent form; hardness, 4–5.5; sp. gr., 5.28; luster, earthy; color, pale yellow to yellowish-white. An analysis yielded: Oxygen, 19.54; antimony, 75.83; water, 4.63 = 100, which gives the formula $SbO_4 + HO$. A species not as yet well defined.

Stibioferrite, an amorphous mineral found coating stibnite in Santa Clara co., Cal.; hardness, 4.0; sp. gr., 3.598; luster, somewhat resinous; color, yellow. An analysis yielded: Antimonic acid, 47.69; sesquioxide of iron, 35.36; water, 16.94 = 99.99.

Stibiohexargentite, one of two native compounds of antimony and silver, the other being stibiotriargentite. Composition: Antimony and silver, with formula Ag_6Sb_2. Petersen considers that all analyses of dyscrasite indicate mixtures of these two compounds.

Stibnite, trisulphide of antimony, an ore consisting of 72.88 antimony and 27.12 sulphur. The color is lead-gray or blackish, and is very brittle. This ore is the source of most of the antimony of commerce. Called also antimony glance.

Sticcato, a musical instrument composed of pieces of wood of graduated lengths, flat at the bottom and rounded at the top, resting on the edges of an open box, and tuned to a diatonic scale. The tone is produced by striking the pieces of wood with small hard balls at the end of a flexible stick.

Stich, a verse of whatever measure or number of feet; also a row or line of trees. In Hebrew literature, one of the rhythmic lines which go to constitute the parallelism in the poetic books of Scripture. The books of Job, Psalms, Proverbs, Ecclesiastes, and the Song of Solomon are thus written in the oldest known Hebrew manuscripts, and poetical passages (like Exod. xv: 1–21) in the historic books are still so printed in the Hebrew Bible, whence they have been transferred to the English Revised Version. Th arrangement is of great antiquity, and may have been introduced by the sacred writers themselves. Sometimes prose works are divided into stichs, consisting either of a certain number of words or clauses separated by their sense. It is believed that a stichometrical arrangement pervades the whole Vulgate, the prose as well as the poetic books; and Josephus considered that his works were composed of 60,000 stichs.

Stichæus, in ichthyology, a genus of *Blenniidæ*, with 10 species, peculiar to the coasts near the Arctic circle, ranging to Japan, Norway, and Sweden. They are small fishes, and have the body elongate and covered with small scales, sometimes several lateral lines; dorsal fin of spines only.

Stichochæta, in zoölogy, a genus of *Oxytrichidæ*, with one species, *S. pediculiformis;* akin to *Stichotricha*, but separated therefrom on account of its well-developed anal styles. Free swimming animals, from salt water.

Stichotricha, in zoölogy, a genus of *Oxytrichidæ*, with five species from salt and fresh water. Animalcules elongate, elastic and changeable in form, often excreting and inhabiting a mucilaginous or granular sheath, the anterior half of the body when protruded from this sheath usually twisted like a screw.

Stickleback, a popular name for any of the species of *Gasterosteus*. The 15-spined stickleback lives in salt or brackish water, the others are fresh-water fish; and all, though small in size, are active, greedy, and extremely destructive to the fry of other fishes. Günther records that fact that a young three-spined stickleback (*G. aculeatus*), the common European species, "kept in an aquarium, devoured in five hours' time 74 young dace, which were about a quarter of an inch long, and of the thickness of a horsehair. Two days after it swallowed 62, and would probably have eaten as many every day could they have been procured." In the breeding season the male stickleback constructs a nest, about three inches wide and six inches deep, of stalks of grass and other matters, cemented together with mucus which exudes from his skin. The 15-spined stickleback (*G. spinachia*) is entirely confined to salt and brackish water; the three-spined stickleback (*G. aculeatus*),

the commonest, is found in both fresh and salt water; the short-spined stickleback (*G. brachycentrus*), the four-spined stickleback (*G. spinulosus*), and the nine-spined or 10-spined stickleback (*G. pungitius*), are confined to fresh water.

Stictic Acid, an acid discovered by Knop and Schnedermann. It has a peculiar bitter taste, is slightly soluble in water and in ether, very soluble in boiling alcohol, and is precipitated by acids, acetate of lead, and silver salts.

Stieler, a German cartographer; born in Gotha Feb. 26, 1775; studied law at Jena and Göttingen; received an office in the ministerial department at Gotha in 1797, became a member of council in 1829. His principal works, masterpieces of art and science, are a "Hand Atlas," issued in conjunction with Reichard (75 maps, Gotha 1817–1833; new edition by Petermann, 90 maps, 1872), and a "School Atlas" (Gotha 1821). He died March 13, 1836.

Stier, Rudolf Ewald, a German theologian; born in Fraustadt March 17, 1800; studied at Jena, Halle, and Berlin; and had already labored as pastor at Frankleben near Merseburg and Wichlinghausen in the Wupperthal when he was appointed in 1850 superintendent at Schkeuditz, and in 1859 at Eisleben. Stier was a man of fervent and somewhat mystical piety, and as an exegete he shows absolute faith in the inspiration and infallibility of his text; but he has no other dogmatisms, and his books are full of observations always ingenious and edifying, if sometimes prolix and far-fetched. Among his works the most popular have been "The Words of the Lord Jesus," "Words of a Risen Saviour," "Words of the Angels," and "Words of the Apostles." He died in Eisleben Dec. 16, 1862.

Stifter, Adalbert (stif'ter), an Austrian poet and story-writer; born in Oberplan, in the German Böhmerwald, Oct. 23, 1806. His first volume of idyls and tales, "Studies" (1844), was received with extraordinary public favor; it was succeeded by five other volumes under the same title. Of his longer stories the more noteworthy are: "The Successor" (1857) and "Witiko" (1864). He died in Linz Jan. 28, 1868.

Stifle Shoe, a horseshoe which has a curved bar beneath it, exposing a rounded surface to the ground, so as to give it an insecure foundation. It is placed on the foot of the sound leg, in order to induce the animal to throw the weight of the hind quarters on the foot of that leg which is stifled, that is, has a luxated or weak stifle joint.

Stigand, an English clergyman; became Archbishop of Canterbury; enjoyed great favor with Edward the Confessor, who made him his chaplain, then (1044) Bishop of Elmham or of the East Angles. Eight years later the bishop mediated successfully in the interests of peace between the king and Earl Godwin, and was rewarded with the archbishopric of Canterbury, which had been abandoned by Archbishop Robert. But his appointment was generally looked on as uncanonical, and was still so regarded even after Stigand received the pallium from Pope Benedict X., Benedict's own election being held to be illegal. On the death of Harold, Stigand gave his vote for Edgar Atheling to be king, and for this reason, and because he was a firm friend of the House of Godwin, William the Conqueror distrusted him, and induced the Pope to send a commission of cardinals, who deprived him of his dignities and sentenced him to perpetual imprisonment. But Stigand died shortly afterward in Winchester; it is said he was starved to death, though whether voluntarily or under compulsion is uncertain.

Stigma (plural, **Stigmas,** or **Stigmata**), a mark made with a redhot iron; a brand impressed on slaves and others; also a small red speck on the human skin, causing no elevation of the cuticle; a natural mark or spot on the skin; figuratively, any mark of infamy, disgrace, or reproach which attaches to a person on account of bad conduct; a slur. In anatomy, the projecting part of a Graafian follicle at which rupture occurs. In biology, stigmata are the external openings of the tracheal apparatus in the Insecta and Arachnida. Applied also to the pores of the segmental organs of leeches, and to the openings by which the pneumatocyst communicates with the exterior in some of the Physophoridæ. See SPIRACLE.

In botany, the part of the pistil to which the pollen is applied. It is generally situated at the upper extremity of the style. It is a glandular body, destitute of epidermis, and secretes a viscous material, which is most abundant at the period of fecundation. It is sometimes smooth, at others it may be covered with papillæ or with plumose hairs, or it may have around it an indusium. Morphologically viewed, the stigma is the apex of the carpellary leaf. When there is more than one style, each has a stigma; when there are several, they may coalesce so as to have various lobes or divisions. In most cases the stigma is thicker than the style. It varies greatly in form, and may be capitate, penicillate, plumose, or feathery, petaloid, peltate, filiform, or papillose. In some cases the stigma extends down the inner face of the style; it is then called unilateral. In ecclesiology, stigmata is a term borrowed from Gal. vi: 17, "I bear in my body the marks (Greek and Vul-

gate, *stigmata*) of the Lord Jesus," and applied by ecclesiastical writers to the marks of STIGMATIZATION (*q. v.*). St. Paul probably took his metaphor from the fact that pagan soldiers sometimes branded the name of their general on some part of their body. No writer of authority has ever maintained that the stigmata of St. Paul were anything more than the actual marks of suffering inflicted by his persecutors (Cor. ii: 23–27).

Stigmaria, in palæobotany, a pseudogenus of coal plants, now proved by actual union to be the roots chiefly of *Sigillaria*, but in some cases of *Lepidodendron*. Cylindrical, trunk-like bodies, often more or less compressed, the external surface of which is covered with shallow pits, sometimes with a rootlet projecting. Very abundant in the fireclay of the carboniferous rocks, the old soil in which the *Sigillariæ* grew. The common species is *S. ficoides*.

Stigmatization, the appearance or impression of counterparts of all or some of the wounds received by Jesus in His Passion, in their appropriate positions on the human body. The first case on record, and the most important, is that of St. Francis of Assisi, the founder of the Franciscans. It is said that while the saint was engaged in a fast of 40 days on Mount Alvernus, in the year 1224, a crucified seraph with six wings appeared and discoursed to him of heavenly things. Francis fainted, and on recovering consciousness found himself marked with the wounds of crucifixion in his hands, his feet, and right side. Thomas à Celana and St. Buonaventura attested the case, and Pope Alexander IV. (1254–1261) claimed to have seen the stigmata during the lifetime of St. Francis and after his death. A feast of the Stigmata of St. Francis is celebrated in the Roman Church on Sept. 17. The Dominicans claimed a similar distinction for a saint of their order (St. Catherine of Siena, 1347–1380), and the fact of her stigmatization is recorded in the fifth lection of the office of her feast (April 30) in the Roman Breviary. She is honored with a special feast in her own order, though she is never represented in painting or sculpture with the stigmata. Since then many persons have claimed to have received these marks of divine favor. There is an excellent account of one of the latest cases — that of a Belgian peasant woman, Louise Lateau — in "Macmillan's Magazine," April, 1871. Carpenter sees nothing either incredible or miraculous in these cases. "The subjects have been persons of strongly emotional temperament, who fell into a state of profound reverie, in which their minds were wholly engrossed by the contemplation of their Saviour's sufferings, with an intense direction of their sympathetic attention to his several wounds; and the power which this state of mind would have on the local action of the corresponding parts of their own bodies what some persons accept as genuine miracles and others repudiate as the tricks of imposture."

Stilaginaceæ, in botany, antidesmads; an order of declinous exogens, alliance Urticales. Trees or shrubs, with simple coriaceous alternate leaves, and twin deciduous stipules. Flowers minute, in axillary scaly spikes. Flowers unisexual, with two, three, or five-parted calyx, and no corolla. Males, stamens two or more, arising from a tumid receptacle; females with a three or four-toothed sessile stigma, and a one or two-celled ovary, with the ovules suspended in pairs. Fruit drupaceous. Found in the East Indies and Madagascar. Known genera three, species about 20.

Stilago, the typical genus of *Stilaginaceæ*, not sufficiently distinct from *Antidesma*. The shining, subacid fruit of *S. bunius* is eaten. The leaves are acid and diaphoretic; the young ones are boiled with potherbs, and given in India in syphilis.

Stilbaceæ, stilbids; an order of perigynous exogens, alliance Gentianales. Shrubs, with rigid, leathery, narrow leaves in whorls, articulated at the base, without stipules. Flowers in dense spikes at the point of the branches, sessile, each with three bracts at the base. Calyx tubular, campanulate, limb five-cleft, the segments equal, corolla monopetalous, the limb four, rarely five-parted, somewhat two-lipped; stamens as many as the divisions of the corolla, if five, then one abortive; ovary superior, with two cells, each with an erect ovule; fruit dry, indehiscent. All from the Cape of Good Hope. Genera three, species seven.

Stilbite, a mineral of a shining pearly luster, of a white color, or white shaded with gray, yellow, or red. It has been associated with zeolite, and called foliated zeolite and radiated zeolite.

Stilbous Acid, $C_{15}H_{12}O_3$(?); stilbilic acid; a compound formed by treating bitter almond oil with fuming sulphuric acid. It crystallizes from ether in monoclinic prisms, from alcohol in trimetric prisms, is insoluble in ammonia and melts at 360°. When boiled in caustic potash, it is resolved into benzoic acid and benzoic hydride.

Stiletto, a small dagger with a round pointed blade from 6 to 12 inches long, introduced in the Middle Ages.

Stiletto, The, a single screw, wooden, torpedo boat, the smallest vessel of its class in the United States navy; length, 88 feet, 6 inches; breadth, 11 feet; mean draft, 3 feet; horsepower, 359; armament, six rapid-

fire guns of small caliber; speed, 18.2 knots an hour; crew, 1 officer and 5 men; cost, $25,000. The torpedo discharge from this boat is of the automobile type and designed by Capt. J. A. Howell, U. S. N. It is known as the Howell torpedo and the shell is of hard-rolled brass. The interior parts are of bronze, aluminum-bronze and steel. The diameter of the torpedo is 14.2 inches and its extreme length 10 feet, 9¾ inches, with a displacement of 803 pounds.

Stilicho, Flavius, a Vandal of great genius and bravery, who distinguished himself at the declining period of the Roman empire, was advanced to the highest dignities of the state by Theodosius the Great, and married Serena, the emperor's adopted daughter, besides being intrusted in 394 with the guardianship of his two sons, Arcadius and Honorius. On the division of the empire, Stilicho became virtual governor of the West, in the character of first minister to Honorius, while the same power in the East was exercised by Rufinus, under Arcadius, the other emperor. The military genius of Stilicho, after this period, was exhibited in the reduction of Africa which had been led into a revolt by Eutropius the successor of Rufinus at the Eastern court, and subsequently in the great contests with Alaric and Radagasius. In the year 403 he routed the former near Verona, and in 406 put the hosts of the latter to flight and killed their commander. While Stilicho lived he sustained the fortunes of the Roman name, but he was accused of having a secret understanding with Alaric, and was treacherously put to death in 408. The wives and children of 30,000 Germans who were in his service were massacred at the same time.

Stilifer, in zoölogy, the typical genus of *Stiliferidæ*, a genus of *Pyramidellidæ*. Shell hyaline, globular, or subulate, with a tapering apex; the animal with slender cylindrical tentacles, having at their outer bases small sessile eyes; foot large. Parasites, attached to the spine of sea urchins or immersed in living starfishes and coral. Known species, 16, from the West Indies, Great Britain, the Philippines, etc.

Still, an apparatus for distillation. It consists essentially of a vessel in which the liquid to be distilled is placed, the vapor being conducted by means of a head or neck to the condenser or worm where it is cooled by water or other means, and again forms liquid. The still itself varies greatly according to the purpose for which it is used. It is made of copper, iron, earthenware, or glass, and is heated by naked flame or steam heat. The steam may either be applied on the outside by means of a jacket or inside by the use of a coil. A vacuum still is one in which a partial vacuum is constantly maintained by means of an air pump, distillation under such circumstances being more rapid and at a lower temperature.

Still, John, an English dramatist; born in Grantham, Lincolnshire, England, about 1543. He is reputed to be the author of "A ryght pithy, pleasant, and merrie comedy, intytuled Gammer Gurton's Needle" (1575); it is believed to be the third English comedy. In the 2d act occurs the familiar old ballad, "I Cannot Eat but Little Meat," with chorus, "Backe and side go bare, go bare," supposed to be the first drinking song in the language. He died Bishop of Bath and Wells, Feb. 26, 1607.

Still, William, an American philanthropist and anti-slavery advocate, of African descent; born in Shamony, N. J., Oct. 7, 1821; was chairman and secretary of the Philadelphia branch of the famous "underground railroad" of 1851–1861, and wrote out the narratives of escaping slaves, which constitute the only full account of this organization. His works include: "The Underground Railroad" (1878); and "Struggle for the Rights of the Colored People of Philadelphia." He died July 14, 1902.

Stille, Charles Janeway, an American historian; born in Philadelphia, Pa., Sept. 23, 1819; was graduated at Yale College in 1839, and admitted to the bar, but devoted himself to literary pursuits. During the Civil War he was an active member of the United States Sanitary Commission, of which he afterward became the historian. In May, 1866, he was made Professor of History and English Literature in the University of Pennsylvania, and in 1868 was chosen its provost, which office he held till 1880. In addition to numerous addresses and pamphlets, his publications, include: "Historical Development of American Civilization"; "Studies in Mediæval History"; etc. He died Aug. 11, 1899.

Stillingfleet, Edward, an English clergyman; born in Cranborne, Dorset, England, April 17, 1635. He studied at St. John's College, Cambridge, and was successively appointed rector of Sutton in Bedfordshire (1657), St. Andrews, Holborn (1665), canon of St. Paul's (1670), archdeacon of London (1677), the following year dean of St. Paul's, and Bishop of Worcester (1689). His writings, most of which are controversial, and combat the views of Roman Catholics, Nonconformists, etc., include: "Irenicum, a Weapon Salve for the Church's Wounds" (1659); "Origines Sacræ, or a Rational Account of the Christian Faith" (1662); etc. He died in Westminster March 28, 1699.

Stillingia, a genus of *Hippomaneæ*. Milky trees or shrubs with alternate leaves on petioles which have two glands at the

apex; flowers monœcious, the males usually in crowded terminal spikes, with a bi-glandular bract at the base; calyx cup-shaped; stamens two, with their filaments united at the base; female solitary; calyx tridentate or trifid; stigmas three, simple; ovary three-celled; fruit capsular, globose, with three cells, each one-seeded. From the tropics of Asia and America. *S. sebifera* is the Chinese tallow tree. The root of *S. sylvatica* is considered in the Carolinas and Florida to be a remedy for syphilis.

Still Life, in painting, the representation of inanimate objects, such as dead animals (game, fishes, etc.), furniture, vases, sometimes with fruits and flowers in addition.

Stillman, Thomas Bliss, an American chemical engineer; born in Plainfield, N. J., May 24, 1852; studied chemical engineering in Wiesbaden, Germany. Returning to the United States he was instructor of analytical chemistry in 1874–1876 and 1881–1886; and was then made professor of the same subject at Stevens Institute of Technology. In 1884 he was appointed inspector of oils for New Jersey. He became a member of the principal engineering societies, and was editor of the Stevens Institute "Indicator" in 1895–1898. His publications include "The Rutgers Scarlet Letter" (1873); "Engineering Chemistry" (1897); and numerous contributions on his specialty to American and foreign periodicals.

Stillman, William James, an American artist, journalist, author, and traveler; born in Schenectady, N. Y., June 1, 1828; was graduated at Union College in 1848; began life as an artist; founded and edited the "Crayon," an art journal in New York. He was for many years a correspondent of the London "Times" and the New York "Evening Post," and was especially conversant with the affairs of Greece; he was consul-general to Crete, 1865–1869. His published works are: "The Acropolis of Athens" (1870); "The Cretan Insurrection" (1874); "Herzegovina and the Late Uprising" (1877); "On the Track of Ulysses" (1887); "Reminiscences of a Journalist." He died in Frimley Green, Surrey, near London, England, July 8, 1901.

Stillwater, a city and county-seat of Washington co., Minn.; on St. Croix lake and river, and on the Wisconsin Central, the St. Paul and Duluth, the Chicago, and Northwestern, the Chicago, Milwaukee and St. Paul, and the Chicago, St. Paul, Minneapolis, and Omaha railroads; 18 miles N. E. of St. Paul. The St. Croix boom, through which there annually pass about 300,000,000 feet of pine logs, is N. of the city. Stillwater contains the State penitentiary, public library, a high school, hospital, street railroad and electric light plants, waterworks, National and savings banks, and a number of daily and weekly newspapers. It has flour mills, carriage factories, machine shops, elevators, foundries, etc., and an assessed property valuation exceeding $4,000,000. Pop. (1890) 11,260; (1900) 12,318; (1910) 10,198.

Stilson, Daniel Chapman, an American inventor; born in Durham, N. H., March 25, 1830; was a machinist in the Charleston navy yard, and in 1862 was appointed assistant engineer in the navy. After the Civil War he resumed his trade as a machinist and later invented a wrench that made his name known throughout the mechanical world, and devised other apparatus including a safety fire sprinkler. He died in Somerville, Mass., Aug. 21, 1899.

Stilted Arch, in architecture, a term applied to a form of the arch which does not spring immediately from the imposts, but from a vertical piece of masonry resting on them, so as to give the arch an appearance of being on stilts. Arches of this kind occur frequently in all the mediæval styles, especially as a means of maintaining a uniform height when arches of different widths are used in the same range.

Stilt Plover, in ornithology, the *Himantopus candidus* (or *melanopterus*), which owes its popular name to the great length of its legs, which are about 20 inches long. It breeds regularly in the marshes of the Rhone, and is common in the Spanish Peninsula, on the Lower Danube and the shores of the Black Sea, extending into Africa and Asia. The male is about 13 inches long, greater part of the plumage white, back and wing deep black glossed with green; in the female the back and wings are brownish-black. Collectively, the name is applied to two genera: *Himantopus* and *Recurvirostra.*

Stilts, poles with steps or supports at a sufficient distance from the lower end to allow a man standing on the steps to walk clear of the ground and with longer strides. Useful in all marshy lands, they were in old days specially serviceable in the French Landes, where the shepherds practically spent the whole day on stilts. Elsewhere they serve for crossing streams (as the Upper Tweed and Clyde), for a pastime for boys, and for displays of arobatic skill. At Namur one of the diversions of the carnival was a tournament between bodies of men mounted on stilts.

Stimson, Frederic Jesup, an American lawyer; born in Dedham, Mass., July 20, 1855; was graduated at Harvard University in 1876, and at Harvard Law School in 1878; was admitted to the New York and Boston bars; became assistant attorney-

general of Massachusetts in 1845, and later was chosen general counsel to the United States Industrial Commission. He was the author of several law books, novels, essays, etc., including: "Rollo's Journey to Cambridge"; "First Harvests"; "King Noanett"; "Jethro Bacon of Sandwich"; etc.

Stimulants, in pharmacy, agents which increase vital action, first in the organ to which they are applied, and next in the system generally. Stimulants are of three kinds, stomachic, vascular, and spinal. The name is popularly restricted to the first of these, which act on the stomach, expelling flatulence, besides allaying pain and spasm of the intestines. They are also called carminatives. Examples, ginger, capsicum and chillies, cardamoms, mustard, pepper, nutmeg, etc. Some vascular stimulants act on the heart and the larger vessels, others on the smaller ones. Of the first are free ammonia, alcohol in the form of brandy or wine, camphor, aromatics, etc. Of the latter are acetate of ammonia, guiacum, sassafras, etc. Spinal stimulants increase the function of the spinal cord. Examples, nux vomica, strychnia, cantharides, phosphorus, etc.

Stinde, Julius, a German novelist; born in Kirch-Nüchel, Holstein, Aug. 28, 1841. Among his writings are: "Talks on Natural Science" (1873); several comedies in Plattdeutsch, as "Aunt Lotta"; "The Karstens Family"; two Christmas stories, "Princess Thousandfair" and "Prince Naughty"; "Berlin Art Criticism, with Marginal Notes by Quidam" (1883); and an amusing series of stories of "The Buchholz Family."

Sting, in botany, a stinging hair. Stinging hairs are sharp, stiff hairs, containing an acrid fluid which is injected into the wound which they produce; stimuli. Example, the nettle, in which the apex is expanded into a little bulb which is broken off when the sting is slightly touched.

In entomology, a weapon of defense, concealed within the abdomen of bees, wasps, etc., and capable of exsertion, or forming part of the last joint of the tail in scorpions. The sting of the bee appears to the naked eye a simple needle-shaped organ; but the microscope shows that it is formed of three pieces: A short, stout, cylindrico-conical sheath containing two setæ, or lancets, one edge thickened and furnished with teeth directed backward, the other sharp and cutting. The poison apparatus consists of two glandular elongated sacs, and terminates by one or two excretory ducts. Morphologically viewed, a sting is an altered oviduct. The term sting is sometimes inaccurately used for the bite of a venomous serpent, and of the forked tongue of snakes. See SCORPION.

Stinging Animals, animals that have the power of stinging. To begin with the minutest, it is likely that the trichocysts of the slipper-animalcule (*Paramœcium*) have some such power. Almost all the *Cœlenterates*, such as jellyfish and Portuguese-man-of-war, have STINGING CELLS (*q. v.*), and in a few turbellarians the same recur, while the dorsal papillæ of some nudibranch gasteropods seem to sting the mouths of animals which try to eat them. The stings of ants, bees, and wasps and some other *Hymenoptera* are abdominal structures, perhaps vestiges of appendages, and they are associated with a poison-secreting gland. The poison of spiders is lodged in the cheliceræ or first pair of oral appendages. The sting of the scorpion consists of a double poison gland lodged in the sharply pointed segment or "telson" which lies behind the anus at the end of the tail. The sting rays (*Trygonidæ*) and the sting fish or weevers (*Trachinus*) have no special poison glands, but it is likely that the slime which enters into the ugly wounds caused by their sharp spines is in part the cause of the inflammation which follows. Among the *Scorpænidæ* the genus *Synanceia* has a poison bag in each of the dorsal spines. Finally, the stinging powers of the venomous snakes are due to the modification of one of the salivary glands on each side as a poison gland and to the adaptation of the teeth as fangs. In the poisonous Mexican lizard heloderma an approach to a similar specialization occurs. See POISON: SERPENT: SNAKE.

Stinging Cells, Cnidoblasts, or **Nematocysts,** characteristic of all *Cœlenterata* except *Ctenophores*. To them the jellyfish, Portuguese-man-of-war, sea anemones, and the like owe their power of stinging. They protect their possessors against some of their enemies and they serve to benumb or kill the small animals on which most of the *Cœlenterates* feed. Each stinging cell contains a long coiled lasso or cnidocil bathed in poisonous fluid; at the base of the cavity in which the lasso lies there is a little living matter and a nucleus; projecting from the surface there is often a small trigger-like peak. When the cell is stimulated, in some cases at least by nervous impulse from adjacent nerve-cells, the lasso, which is many times the length of the cell, is rapidly everted. After this has taken place the cell dies. Often the cnidoblasts are grouped in little "batteries" especially abundant on the tentacles or similar structures. They are usually situated on the external ectoderm, but are sometimes endodermic. Similar cells occur in some Turbellarian worms.

Stingray, a fish belonging to the genus *Trygon*, natural order *Elasmobranchii*, family *Trygonidæ*, which is allied to that of the rays proper. It is remarkable for its long, flexible, whip-like tail, which is armed with a projecting bony spine, very sharp at the point, and furnished along both edges with sharp cutting teeth. Only one species (*T. pastinaca*) occurs in the British seas, and is popularly known as the fire flaire. Another species (*Trygon centrura*) is common on the E. coasts of North America. These fishes sometimes inflict serious wounds with their tail.

A STINGRAY.

Stinkomalee, a slang epithet applied by Theodore Hook to London University. At the time of its coining an acrimonious discussion was proceeding in Parliament about Trincomalee, in Ceylon; the institution in question happened to be at loggerheads with King's College and other universities because it receives students of all beliefs.

Stink Ball, a combustible preparation, composed of pitch, rosin, niter, gunpowder, colophony, assafœtida, sulphur, etc. It emits a suffocating smoke and smell, and is thrown among working parties, or on an enemy's deck at close quarters. Still used by the Chinese and Malay pirates.

Stinkstone, or **Swinestone,** a kind of marble or limestone remarkable for the fetid urinous odor which it emits when rubbed. It contains a little sulphur.

Stinkwood, the *Ocotea foetida*, a tree of the natural order *Lauraceæ*, a native of the Cape of Good Hope, remarkable for the strong disagreeable smell of its wood, which, however, is hard, very durable, takes an excellent polish, and resembles walnut. It has been used in shipbuilding.

Stint (*Tringa*), a grallatorial bird, a species of sandpiper. Temminck's stint (*T. Temminckii*) is the smallest species of the British sandpipers, length 5½ inches. It inhabits the edges of lakes and inland rivers, and is said to breed in North Europe.

Stipa, feather grass; the typical genus of *Stipeæ*. Inflorescence an erect, somewhat contracted panicle; spikelets one-flowered; glumes two, membranaceous, larger than the floret, outer one involute, with a very long, twisted awn, which finally separates at a joint near its base. Steudel describes 104 species. They are widely distributed, but are most abundant in warm countries. *S. pennata* is the common feather grass. It has rigid, setaceous, grooved leaves, and exceedingly long awns, feathery at the point. It is very ornamental in gardens in summer, and if gathered before the seeds are ripe it retains its long feathery awns, and is sometimes dyed of various colors and used for decorative purposes.

Stipend, a periodical payment for services rendered; an annual salary or allowance, especially the income of an ecclesiastical benefice, and in the Roman Church the sum which a priest may demand for saying mass for a special intention. In Scotland, a term applied specifically to the provision made for the support of the parochial minister of the Established Church. It consists of payments made in money or grain, or both, varying in amount according to the extent of the parish, and the state of the free teinds, or of any other fund specially set apart for the purpose.

Stiper Stones, or Arenig formation, the lowest series of rocks in the Silurian system. It consists of several thousand feet of flags, shales, and siliceous or quartzose sandstones with contemporary igneous rocks, well developed in Merionethshire, Shropshire, and in the Lake district of England. The formation is analogous to the calciferous sandstones, etc., in the State of New York. About 80 species of fossils have been detected in the British rocks of this period, though, with the exception of annelid burrows, specimens are not abundant.

Stipple, in engraving, a mode of producing the desired effect by means of dots; also called the "dotted style," in contradistinction to "engraving in lines." See ENGRAVING.

Stipule, or **Stipula** (plural, **Stipulæ**), in botany, one of two small appendages, generally tapering at the end, situated at the base of a petiole on each side, and generally of a less firm texture than the petiole itself. They either adhere to the base of the petiole or are separate; they may last as long as the leaf, or fall off before it. In texture they may be membraneous, leathery, or spiny; in margin entire or laciniated. Stipules are absent in exogens with opposite leaves, in some with alternate leaves, and in the great majority of endogens. They are probably transformed leaves. Also appendages at the base of the leaves in *Jungermanniaceæ* and *Hepaticæ*.

Stirling, James Hutchison, a Scotch philosopher; born in Glasgow, Scotland, June 22, 1820; was educated in arts and medicine in Glasgow University, France, and Germany; practised as a surgeon in Wales for some years, but ultimately devoted himself to literary and philosophical studies. He was the author of "The Secret of Hegel" (1865); "Sir William Hamilton, being the Philosophy of Perception" (1865); "Jerrold, Tennyson, Macaulay, and other Essays" (1868); "As regards Protoplasm" (1869); "The Philosophy of Law" (1873); "Burns in Drama, together with Sacred Leaves" (1878); "Text-book to Kant" (1881); "The Community of Property" (1885); "What Is Thought?" (1899); and translator of Schwegler's "Hand-book of the History of Philosophy." He became lecturer on Natural Theology at Edinburgh in 1888. He died Mar. 19, 1909.

Stirling, William Alexander, Earl of, a British poet; born in 1580. He published several tragedies and poems which were highly thought of; obtained many royal favors, including a grant of Nova Scotia by James I., and of the lordship of Canada by Charles I.; and was made Earl of Stirling in 1633. He died in London, England, Sept. 12, 1640.

Stirling-Maxwell, Sir William, a Scotch biographer and art critic; born near Glasgow, Scotland, in 1818. He was member of Parliament, 1852–1878; rector of the University of St. Andrews, 1863; of that of Glasgow, 1872; chancellor of the latter, 1875. He wrote the valuable works: "Annals of the Artists of Spain" (3 vols. 1848); "Cloister Life of Charles V." (1852); "Velasquez and his Works" (1855); and others. He died in Venice, Italy, Jan. 15, 1878.

Stirlingshire, a fertile county of Scotland, on the isthmus between the Firths of Forth and Clyde, and forming part of the border land between the Highlands and Lowlands; area, 298,579 acres. It is bounded N. by Perth and Clackmannan, from which it is separated by the Forth, E. by the Firth of Forth and Linlithgow, S. by Lanark and Dumbarton, and W. by Dumbarton and Loch Lomond. The parish of Alva forms a detached portion of Stirlingshire, and there is another small portion toward the W. extremity of the Ochils. The district of the "Carse," 36,000 acres in extent, stretching along the Forth, is only a few feet above the level, but in the W. and S. the surface is varied by tracts of heath, moss, and pasture. In the N. W. is Ben Lomond, in the N. E. part of the Ochils and in the S. the lower Campsie Fells. Besides the Forth, the streams of Stirlingshire are the Avon, Allander, Kelvin, Endrick, Bannock, Carron, Allan (for about a mile), etc. The county includes rich coal and iron districts. There are some 40,000 acres of oak coppice, yielding a large supply of bark. The soil is varied, and agriculture is in a highly proficient state. Wheat and beans are abundantly produced in the Carse, and potatoes and turnips in the higher "dryfield" farms. The manufacture of carpets, tartans, plaidings, shawls, and other woolens is carried on at Bannockburn, Cambusbarron, etc. There are large ironworks at Carron; cotton mills at Fintry, Balfron, and Milngavie; printfields at Denny, Milngavie, Lennoxtown, etc.; tanworks at Stirling and Falkirk; and shipping yards at Grangemouth.

Stirrup, a leather strap or similar device, suspended from a saddle and having at its lower end a loop, ring, or other suitable appliance for receiving the foot of the rider, and used to assist him in mounting a horse, as well as to enable him to sit steadily in the saddle while riding, and also to relieve him by supporting a part of the weight of the body. Stirrups were not known to the ancients, and in the 2d century B. C., the highways in and around ancient Rome were fitted with stones to enable horsemen to mount. Stirrups were introduced about the 5th century but were not general till about the 12th. In carpentry, a device for holding a rafter-post or strut to a tie. In wooden construction it consists of a wrought-iron loop, secured by a through bolt to one piece and embracing the foot of the other. In iron framing the stirrup is usually wrought on the tie. Also an iron strap to support a beam. In machinery, a band or strap which is bent aromnd one object and is secured to another by its tangs or branches. Also the iron loop or clevis by which the mill saw is suspended from the muley head or in the sash. In nautical language, a rope with an eye at the end for supporting a foot-rope below its yard. In shipbuilding, a plate which laps on each side of a vessel's dead-wood at the stem or stern, and bolts through all.

Stitch, in the side, the popular and expressive name applied to sharp pains felt in various parts of the side. It seems that these may be due to various causes; thus, they may be associated with pleurisy where there is no effusion, or with a stretching of the not uncommon adhesions between two pleural surfaces, or simply with local spasms of the respiratory muscles, as when a person takes violent exercise after a full meal, or perhaps even with a slight twisting of part of the intestine. When the stitch is but slight it is often removed by stooping, hence the popular remedy is to make a cross on the foot.

Stitchwort, the *Stellaria*, a genus of *Caryophyllaceæ*, of which there are about 70 species (7 British)—all slender herbs, widely distributed through the temperate

and cold regions of the globe. The best-known members are the great stitchwort (*S. Holostea*), which from its large white flowers in early summer is an ornament of hedgerows and pastures; wood stitchwort (*S. nemorum*), frequent in the N. of England and Scotland in shady places, but not so striking as the above; and the chickweed (*S. media*), native through Arctic and N. temperate regions, and now a cosmopolitan naturalized weed. The great stitchwort was supposed to cure "stitch" in the side, hence the name.

Stiver, an old Dutch coin and money of account worth about two cents in money of the United States.

Stoat. See ERMINE.

Stobæus, Joannes, a native of Stobi, Macedonia, who compiled for his son Septimus, about A. D. 500, an anthology in four books from as many as 500 Greek poets and prose writers. It has preserved for us fragments from many works now lost, and is especially rich in quotations from the Greek dramatists. Originally forming one whole, the work in course of time became divided into two divisions, each of two books: "Physical and Ethical Eclogues" (ed. Gaisford, 1850; Meineke, 1860–1864), and "Anthology" (Wachsmuth, 1884), containing the precepts on political and ethical subjects (ed. Gaisford, 1822–1825; Meineke, 1856–1857).

Stock, a name originally applied to a cruciferous garden plant, *Matthiola incana* (called more fully stock gillyflower), but now extended to the various species of *Matthiola*, and to certain allied plants of the same order. They are herbaceous or shrubby, biennial or sometimes perennial, and have single or double fragrant flowers. *M. incana* is probably the parent of the greater number of the hoary-leaved varieties cultivated in Great Britain, and known as Brompton stock, queen stock, etc. *M. annua* is the source of the common or 10 weeks' stocks, and *M. græca* of the smooth-leaved annual stocks. The Virginia stock (*Malcolmia maritima*) has been introduced from the Mediterranean, and like the species already mentioned is a great favorite in the flower garden on account of its beauty and fragrance.

Stockade, an inclosure or pen made with posts and stakes. In civil engineering, a row of piles, or a series of rows with brushwood in the intervals, driven into a sea or river shore, to prevent the erosion of the banks. In fortification, stout timbers planted in the ground so as to touch each other, and loopholed for musketry. In its most effective form it is eight or nine feet high, has a ditch in front and a banquette in the rear. As appears from Elton's history (and from the still surviving customs of savage races), the driving of timber into the ground was an early form of fortification.

Stock Dove (*Columba œnas*), the common wild pigeon, 14 inches in length, and with a general bluish gray plumage, the breast being purplish. It raises two or three broods in a season and builds its nest in a tree stump or in a rabbit burrow.

Stock Exchange, a market for the purchase and sale of public stocks, shares, and other securities of a similar nature. In London during the 18th century transactions of this kind were conducted in and about the Royal Exchange, but in 1773 the stockbrokers in the form of an association removed first to Sweeting Alley and then to Capel Court, Bartholomew Lane. There a new building was erected in 1801, and with the great increase of business the premises have since been repeatedly extended. The business of the London Stock Exchange is managed by a committee chosen annually by ballot. There are now similar institutions in all large cities of the United Kingdom and the United States. The New York Stock Exchange was founded in 1792.

Stockholm, the capital of the kingdom of Sweden; on several islands and the adjacent mainland, between a bay of the Baltic and Lake Mälar; in a situation that is accounted one of the most picturesque in Europe. The nucleus of Stockholm is an island in mid-channel called "the Town"; on it stand the imposing royal palace (1697–1754); the principal church (St. Nicholas), in which the kings are crowned; the House of the Nobles (1648–1670), in which that class hold their periodical meetings; the town house; the ministries of the kingdom; and the principal wharf, a magnificent granite quay, fronting E. Immediately W. of the central island lies the Knights' Island (*Riddarholm*); it is almost entirely occupied with public buildings, as the Houses of Parliament; the old Franciscan Church, in which all the later sovereigns of Sweden have been buried; the royal archives; and the chief law courts of the kingdom. To the N. of these two islands lie the handsomely built districts of Norrmalm, separated from them by a narrow channel, in which is an islet covered with the royal stables. The principal buildings and institutions in Norrmalm are the National Museum (1850–1865), with extremely valuable collections of prehistoric antiquities, coins, paintings, sculptures; the principal theaters; the Academy of the Fine Arts (1735); the barracks; the Hop Garden, with the Royal Library (1870–1876), and with the statue (1885) of Linnæus; the Academy of Sciences (1739), with natural history collections; the Museum of Northern Antiquities (1873); the Observatory;

and technological, medical, sloyd, and other schools.

Ship Island (*Skeppsholm*), immediately E. of "the Town" island, is the headquarters of the Swedish navy, and is built over with marine workshops, shipbuilding yards, etc., and is connected with a smaller island on the S. E., that is crowned with a citadel. Beyond these again, and farther to the E., lies the beautiful island of the Zoölogical Gardens (*Djurgard*). Immediately S. of "the Town" island is the extensive district of Södermalm, the houses of which climb up the steep slopes that rise from the water's edge. Handsome bridges connect the central islands with the N. and S. districts; besides busses and tramways, the principal means of communication are quick little steamboats, some of which extend their journeys to the beautiful islands in Lake Mälar on the W., and E. toward the Baltic Sea (40 miles distant). Besides the institutions already mentioned Stockholm is the home of the Swedish Academy (1786), Academies of Agriculture (1811), Music (1771), and the Military Sciences (1771), a naval school, a school of navigation, of pharmacy, etc. There is considerable industry in the making of sugar, tobacco, silks and ribbons, candles, linen, cotton, and leather, and there are large iron foundries and machine shops. The water approaches to the city are in general rendered inaccessible by ice during three or four months every winter; but to remedy this defect it is proposed to build a new harbor at Nynäs on the Baltic shore, 30 miles to the S. In spite of the winter drawback Stockholm is the seat of a trade sufficient to bring an average of 1,760 vessels of 635,000 tons into the port every year, carrying principally grain (wheat and rye), rice, flour, herrings, oils and oilcake, cork, groceries, metals, and wine and spirits (imports). The commodities exported consist chiefly of iron and steel, oats, and tar.

Though Stockholm was founded by Birger Jarl in 1255, it was not made the capital of Sweden till comparatively modern times. Since then, however, it has grown rapidly; pop. (1800) 75,500; (1890) 246,151; (1909) 339,582. The principal events in the history of the city have been the sieges by Queen Margaret of Denmark (1389), the battles in the vicinity against the Danes toward the end of the 15th century, the capture of the place by Christian II. of Denmark in 1520, and the Blood Bath he executed among the principal men of the country in what was then the Great Market.

Stocking, a close-fitting knit or woven covering for the foot and leg. It is made of wool, cotton, or silk. The clothing of the legs and lower part of the body formerly consisted of a single garment, called hose, in French *chausses*. It was afterward cut in two at the knees, leaving two pieces of dress, viz., knee-brecches, or, as they were then called, upper stocks, or in French *haut de chausses*, and the nether stocks, or stockings, in French *bas de chausses*, and then simply *bas*. In these terms the element stock is to be understood in the sense of stump or trunk, the part of the body left when the limbs are cut off. In the same way German *strumpf* = a stocking, properly signifies a stump. Also an elastic bandage used as a support, and to remedy varicose veins, injuries to the tendons, etc., occurring in the human leg. A coarser and stronger kind is used in veterinary surgery.

Stock Jobbing, the practice of dealing in stocks or shares, especially by persons who buy and sell on the stock exchange on their own account and not for clients, as do the stockbrokers properly so called. The transactions carried out are often entirely of a gambling nature, and the jobber may neither have stock of his own to buy nor to sell. This business is now carried on to an amazing extent, and is of this character: A. agrees to sell B. $50,000 of bank stock, for instance, to be transferred in 20 days, for $60,000. Now if the price of bank stock on the day appointed for transfer should be only 118 per cent., he may then purchase as much as will enable him to fulfil his bargain for $59,000 and thereby gain $1,000 by the transaction. Should the price of bank stock, however, advance to 125 per cent., he will have to pay $62,500 for the necessary amount of stock and will thus lose $2,500 by completing his agreement. In New York, Philadelphia and other American stock exchanges the delivery of the stock is required; in London, where "time contracts" prevail, the stock is not usually transferred.

Stockmar, Christian Friedrich, Baron von, a German diplomatist; born, of Swedish descent, in Coburg, Germany, Aug. 22, 1787; studied medicine and after some service with the army was appointed physician to Prince Leopold of Coburg, ere long to become his secretary and most influential adviser on all questions personal and political. As such he came to England with Leopold when he became the husband of the Princess Charlotte; and he gave Leopold valuable support in the negotiations that issued in making him King of Belgium. He had been ennobled in 1821 and was made a baron in 1831. Leaving Leopold's service in 1834 he became the mentor of Prince Albert of Coburg, and was the trusted friend of the young Queen of England and her husband, living sometimes in England and sometimes in Coburg. As representative of Coburg in 1848 at the Diet, he supported Prussia's claim to the headship of

the German nation. He died in Coburg, July 9, 1863.

Stockport, a parliamentary and municipal borough of England, partly in Cheshire and partly in Lancashire, 5 miles S. E. of Manchester, on the Mersey. It occupies an elevated site, on which the houses rise in irregular tiers, giving it a picturesque appearance. Its chief structures are St. Mary's Church, Christ Church, the free grammar school, the Sunday-school, the free library, the museum situated in Vernon Park, and the immense railway viaduct which here crosses the Mersey. The cotton trade, connected with which are spinning, weaving, dyeing, etc., is the staple, and there are also foundries, machine shops, breweries, etc. Pop. (1901), 78,871.

Stocks, an apparatus formerly used for the punishment of petty offenders, such as vagrants, trespassers, and the like. It consisted of a frame of timber, with holes in which the ankles, and sometimes the ankles and wrists, of the offenders were confined. In farriery, etc., a frame in which refractory animals are held for shoeing or veterinary purposes. In shipbuilding, a frame of blocks and shores on which a vessel is built. It declines down toward the water, and is usually a timber frame, which, as the building proceeds, assumes the form of a cradle. The cradle rests on ways, on which it eventually slides when the vessel is launched. The vessel is laterally supported by shores; the cradle is held by struts and chocks. In launching, the shores are removed, so that the vessel rests altogether in the cradle; the ways are greased or soaped; the struts are knocked away; the chocks knocked out, and the ship slides down the ways into the water, where the cradle becomes detached and floats away. In finance, a stock is a fund employed in the carrying on of some business or enterprise, and divided into shares held by individuals who collectively form a corporation. Also a fund in England consisting of a capital debt due by the government to individual holders, who receive a fixed rate of interest on their shares; money funded in government securities; as, the 3 per cent. stocks.

Stockton, a city and county-seat of San Joaquin co., Cal.; at the head of Stockton Channel, an arm of San Joaquin river, and on the Southern Pacific railroad, and connected with the Atchison, Topeka and Santa Fé, and several other railroads; 78 miles E. by N. of San Francisco. Here are the State Insane Asylum, a high school, the Hazelton Public Library, a private sanitarium, St. Agnes's Convent, waterworks, street railroad and electric light plants, fire department, National, State, and private banks, and daily, weekly, and monthly periodicals. Stockton is an important point for the shipment of wool and wheat. Being within 2½ miles of the San Joaquin river, connected by a navigable channel, the city is in excellent position for water-traffic between San Francisco (85 miles) and the fertile San Joaquin valley, with its great shipments of grain, produce, and hay, and the mining and lumber regions on the E. side of the valley. Both Congress and the California legislature have made large appropriations for clearing and keeping its waterways, and both by water and by rail its commerce is large and growing. Stockton has iron foundries, tanneries, lumber and paper mills, flour mills, machine shops, a terra cotta plant, car works, warehouses, agricultural implement works, etc., and an assessed property valuation of nearly $14,000,000; its bonded indebtedness being $144,000. The original settlement was under a Mexican grant in 1843; from 1848 onward it was an important supply point for the mines, and was greatly advanced in 1869 by the coming of the overland mail connection. The town was incorporated in 1850, and named in honor of Commodore Stockton of the U. S. Navy, so prominent in the conquest of California from Mexico. Pop. (1890), 14,424; (1900), 17,506; (1903), 18,588 in the city alone, with its suburbs, 21,659; (1910), 23,253.

Stockton, a river-port of England, in the county of Durham, 11 miles E. N. E. of Darlington; on the left bank of the Tees; 4 miles above its mouth. Its Anglican churches include St. Thomas's (1712; restored 1859), with a tower 80 feet high; St. James's (1868), in French First Pointed style, with a spire of 130 feet; and St. John's (1872), a brick edifice of the basilica type; and of numerous non-established places of worship the finest are the Roman Catholic St. Mary's (1842—1870), designed by the elder Pugin in Early English style; and the United Presbyterian St. Andrew's (1861). Other buildings are the town hall and assembly rooms (1735), the borough hall (1852), exchange (1874), postoffice (1878), free-masons' hall (1872), surgical hospital (1875), and a cattle market constructed 1876. Stockton is an important railway center, and its harbor has an extensive trade. Pop. (1901) 51,478.

Stockton, Francis Richard, an American author; born in Philadelphia, Pa., April 5, 1834; became an engraver and draughtsman; was connected with the Philadelphia "Post," and with "Hearth and Home," New York; joined the editorial staff of "Scribner's Monthly," and became assistant editor of "St. Nicholas." His earliest writings were odd tales for children, but he also attained an enviable reputation as a writer of highly entertaining short stories, marked by quaintness of subject and treatment and by dry humor. The first of these were the "Rudder Grange Stories," followed by very many others, of which, perhaps, the best known are: "The

Lady or the Tiger," "The Late Mrs. Null," "The Casting Away of Mrs. Lecks and Mrs. Aleshine," and its sequel, "The Dusantes," "The Hundredth Man," "A Tale of Negative Gravity," etc. He died in Washington, D. C., April 20, 1902.

Stockton, Robert Field, an American naval officer; born in Princeton, N. J., Aug. 20, 1795; entered the navy in 1810; was promoted lieutenant in 1814; engaged in the war with Tripoli in 1814–1815; went to Africa in 1821 in command of the "Erie," where he secured the territory forming the present republic of Liberia; was sent against the pirates and slavers in the West Indies in the fall of the same year; and served as flag-officer in the Mediterranean under Preble in 1838–1839. He was one of the earliest advocates of a steam navy; drew the plans for the steam sloop of war "Princeton," the explosion of one of whose guns at Washington in 1844 caused the death of the secretaries of war and the navy; was actively interested in the construction of the Delaware and Raritan canal; and during the Mexican War, as commander of the naval forces on the Pacific, took possession of California in the name of the United States. On his return in 1850 he resigned his commission; entered politics; and in 1851 was elected to the United States Senate, where he introduced and put through a bill for the abolition of flogging in the navy, and also urged the adoption of measures for coast defense. In 1853, however, he retired from the Senate, and devoted himself to the development of the Delaware and Raritan canal. He died in Princeton, N. J., Oct. 7, 1866.

Stockyard, an inclosure for cattle on the way to or at market. With the development of the Central and Western States of the Union there arose a necessity for central markets for the disposition and distribution of the enormous live stock production of these regions. To meet such a demand there were established at convenient points at the convergence of the great lines of railway, immense stockyards. By this term is not to be understood merely inclosures into which live stock can be driven and herded, but all the buildings and conveniences necessary for the shipping, to all parts of the world, of the animals there collected either "on the hoof" or in the various forms in which their slaughtered carcasses are known to commerce. During the earlier years of this particular branch of domestic enterprise the centers of the business were unsettled, and we find various cities throughout the great cattle-raising regions disputing for supremacy in the amount of business done. Great stockyards were established and still exist in Cincinnati, Indianapolis, East St. Louis, Kansas City, Chicago, and other cities. Owing to the remarkable growth of Chicago, not many years elapsed before that city had outstripped all competitors. Besides the great establishments of the West and Northwest there are like institutions of minor importance distributed throughout other portions of the Union. See ABATTOIR.

Stoddard, Amos, an American military officer; born in Woodbury, Conn., Oct. 26, 1762. He fought in the Revolutionary War; was governor of Missouri Territory in 1804–1805; served in the War of 1812; published "Sketches of Louisiana" (1812); and died in Fort Meigs, O., May 11, 1813.

Stoddard, Charles Warren, an American author; born in Rochester, N. Y., Aug. 7, 1843; studied (without graduating) at the University of California; was for some time an actor; for seven years special traveling correspondent of the San Francisco "Chronicle," visiting nearly every quarter of the globe, including five years in the South Seas; from 1885 to 1887 Professor of English Literature at Notre Dame College, Indiana; and from 1889 at the Catholic University of America. Among his publications are: "South Sea Idylls" (1873); "Summer Cruising in the South Seas" (1874); "Mashallah" (1880); "The Lepers of Molokai" (1885); "Lazy Letters from Low Latitudes" (1894); "Over the Rocky Mountains to Alaska" (1899); "Hither and Yon"; "The Dream Lady"; etc. He died April 24, 1909.

RICHARD HENRY STODDARD.

Stoddard, Elizabeth Drew (Barstow), an American novelist and poet; born in Mattapoisett, Mass., May 6, 1823. She was the wife of Richard H. Stoddard, and the author of three distinguished novels, "The Morgesons" (1862); "Two Men" (1865); "Temple House," illustrative of English character and scenery (1867); and "Lolly Dink's Doings," a story for young readers (1874); "Poems." She died Aug. 1, 1902.

Stoddard, Richard Henry, an American poet; born in Hingham, Mass., July 2,

1825; attended schools in New York, and then worked in an iron foundry for some years, meanwhile reading widely, especially in poetry. In 1849 he produced a small volume of poems only to suppress it afterward; but 1852 saw the birth of a sturdier collection. From 1853 to 1870 he served in the New York custom house, in 1870–1873 was clerk to General McClellan and for a year city librarian; he did also much reviewing and writing for the publishers. His poems include "Songs in Summer" (1857); "The King's Bell" (1862); "The Book of the East" (1867); "Lion's Cub" (1891); "Under the Evening Lamp", etc.; he wrote also "Life of Humboldt"; "Abraham Lincoln"; "Life of Washington Irving." Died May 12, 1903.

Stoddard, William Osborn, an American author; born in Homer, N. Y., Sept. 24, 1835; was graduated at the University of Rochester in 1857, and after serving for a short time in the Civil War was made secretary to President Lincoln, which office he held till 1864 when he became United States marshal of Arkansas. Subsequently he engaged in business and journalism in New York city where he also held several public offices under the municipal government. He was the author of numerous stories, sketches and poems, including "Life of Abraham Lincoln"; "Chuck Purdy"; "The Sword-Makers' Inn"; "Ulric the Gaul"; "Montayne"; "Jack Morgan"; etc.

Stoics, the name applied to a body of philosophers who flourished first in Greece about the 4th century, but whose influence finally spread over the whole classical world. Their place in the history of philosophy is immediately after Plato and Aristotle. These two mighty genuses had in turn made the greatest efforts that have ever been made to give finality to philosophy, by putting forth a reasoned theory of the universe. Later thinkers began to seek rather for a practical system by which to live than to again attempt to solve the secret of existence. Hence stoicism is a code of practical rules as much as a reasoned theory: still, as it was the former in a philosophical manner, it necessarily had the latter. The leading thought of the Stoics may be thus stated. They divided philosophy into three parts — logic, physics, and ethics. "Logic supplies the method for attaining to true knowledge; physics teach the nature and order of the universe; and ethics draw thence the inferences for practical life."

The only means we have of knowing about a thing is by the impression it makes on us: but we have many impressions which are certainly false: how are we to discriminate between the false and true? The Stoics answered this by asserting that a true impression would come home to us by a sort of "striking evidence." The irresistible force of truth would influence our minds in a way that false impressions were utterly unable to do. Being true, they would force us to believe they were true. In their physics (which were really metaphysics) the stoics enunciated a theory of pantheism. "The world is produced, animated, ruled by God; it is a prodigious living thing (*zōon*), the rational soul of which is God." It follows, then, that all is wisely willed, that evil is only apparent, and that for man (here we pass into ethics) the highest good is to live in accordance with the perfect life of the universe. Here we have the celebrated stoic maxim, "Follow Nature." but if this be so, pleasure which is a merely individual thing cannot enter into a true theory of life. It is hostile or at least indifferent to virtue, for that is the fashioning of the life of the individual after the universal.

Material goods are of no importance to the individual, save in so far as they aid him in the pursuit of virtue. They have no absolute value nor have any external things; though some, through the chance assistance they may give to virtue are preferable to others. Since virtue is the life in accordance with nature, the least departure from it destroys its absolute nature. "He only is good who is perfectly good; vicious is every one who is irrational or wrong in any one point." Virtue is absolute justice — absolute perception of the good and true, and its exact reproduction in the individual life. That is the duty of a man himself, and he must help other men to fulfil theirs. He must help them equally, and fully also, for the "entire race ought to form a single community with the same principles and laws." The ideal of virtue is painted in the stoic picture of the "Wise Man." Living absolutely in accord with the central principle of the universe, he possesses all knowledge and all aptitudes. He alone is the true statesman, king, educator, critic and physician. In social life none but he can be a true friend. Absolutely independent of earthly things, he leads a life undisturbed by their ceaseless mutations. His life partakes in its essence of the life of the universe, and as such it cannot be disturbed.

The founder of stoicism was Zeno (340–260 B. C.), who opened his school in the "many colored portico" (*Stoa poecile*); hence the name of the sect. After him came Cleanthes, surnamed the Ass from his stubborn patience. Then Chrysippus (of Soli, in Cilicia, died about 208 B. C.), of whom it was said; "If Chrysippus were not, the Stoa were not," so much was he the central figure of the school. He wrote, it is said, 705 different works, and to him is due the regular exposition of stoicism

as a system of philosophy. After him we have a new period. When Greece was brought under subjection to Rome, her systems of philosophy became known to her conquerors, and no system had more adherents than stoicism. Panaetius and Posidonius, later rulers of the Porch, were friends of the younger Scipio, Cicero, and Pompey. There was something in the stern practical character of stoicism that agreed well with the Roman mind. And how powerful its effect was we see from the great Roman writers. It is essentially the philosophy of Cicero; its influence is felt in Tacitus, and many references in Horace, Juvenal, and Persius as to the external and internal characteristics of the school show its place in the Roman world.

Among its later adherents were Seneca, the tutor and victim of Nero; the slave Epictetus — "the lame old man," as he called himself — whose writings show so remarkable an approximation to Christianity; and Marcus Aurelius, the Roman emperor. Its influence was felt in the composition of the Roman law, which, originally a narrow code, became under the empire the greatest, the most systematic, and in many respects the wisest system of jurisprudence the world has ever seen. Specially stoical, though not stoical alone, was the conception of the Law of Nature, "which Nature teaches all animals," and which in its vast applications as an underlying principle had so much influence of all further legal modifications. Though stoicism as a system fell to pieces with the ancient world, it essentially reappeared in the ascetic forms of Christianity and other religions. But the reason is, not that they were descended from stoicism, but that both came from a common source. Stoicism has its origin in human nature. It is not all truth, but truth is many sided and this system is at least one aspect of it.

Stoke Poges, a village of Buckinghamshire, England; 2 miles N. of Slough station. Gray's mother settled here in 1742; the beautiful churchyard is the scene of his "Elegy," and in that churchyard he is buried.

Stokes, Frank Wilbert, an American artist; born in Nashville, Tenn.; received an academic education; studied art at the Philadelphia Academy of Fine Arts and then in Paris. In 1892 while employed as an artist for the Charles Scribner's Sons, he accompanied the Peary relief expedition, and in 1893–1894 he was with the North Greenland expedition. He became identified with the Anthropological Society, the Geographical Society, the Polar Research Club, and the Academy of Natural Sciences in Philadelphia. His publications include essays on "Color in the Far North" (1894); "An Arctic Studio" (1896); "Essentials of Polar Expeditions"; etc.

Stokes, Sir George Gabriel, a British scientist; born in Kreen co., Sligo, Ireland, Aug. 13, 1819; was educated at Bristol and at Cambridge, taking his degree in 1841 as senior wrangler and first Smith's prizeman. In 1849 he was appointed Lucasian Professor of Mathematics at Cambridge. He became a member of the Royal Society in 1851, was awarded the Rumford medal for his investigations on light, and was president of the Royal Society from 1885 till 1888. He was honorary fellow of several foreign societies, D. C. L. and LL. D. of Oxford and Edinburgh, and was president of the British Association in 1869. His writings have been mostly contributed to the transactions of the learned societies. In 1889 Professor Stokes who was M. P. for Cambridge University, was created a baronet. He died Feb. 1, 1903.

Stokes, William, an Irish physician; born in 1804; studied at Edinburgh; and in 1845 became Regius Professor of Medicine in Dublin University. He wrote lectures on the "Theory and Practice of Medicine" (1837), and works on the diseases of the chest and of the heart and on continued fevers. He died in 1877. His eldest son, WHITLEY STOKES, born in Dublin in 1830, studied law at Trinity College, went to India in 1863, and after holding a series of important legal appointments was in 1877–1882 president of the Indian law commission and draughtsman of the present civil and criminal codes. He wrote many legal works, including "The Anglo-Indian Codes" (vols. i. and ii. 1887–1888), and edited a large number of Irish and other Celtic glosses and texts. He died April 13, 1909.

Stoke=upon=Trent, a manufacturing town of Staffordshire, England; capital of the "Potteries," on the Trent and the Trent and Mersey canal; 15 miles S. E. of Crewe. It is a modern place dating only from the last quarter of the 18th century, and has a parish church with Wedgwood's grave, a town hall (1835), a market hall (1883), a free library (1878), the Minton memorial building (1858), the Hartshill Infirmary (1868), public baths, and statues of Wedgwood, Minton, and Colin Minton Campbell. Its factories of porcelain, earthenware, encaustic tiles, and tesselated pavements are among the largest in the world; and the industries also include coal mining, brickmaking, and the manufacture of iron, engines, machinery, etc. Mrs. Craik was a native. Pop. (1901) 30,458.

Stola, a loose garment worn by Roman matrons over the tunic. To the bottom of it a border or flounce was sewed, the whole reaching down so low as to conceal the ankles and part of the feet. It was the characteristic dress of the Roman ma-

trons, as the toga was of the men; divorced women or courtesans were not allowed to wear it. It was usually gathered and confined at the waist by a girdle, and frequently ornamented at the throat by a colored border. It had either short or long sleeves, and was fastened over the shoulder by a fibula.

Stolberg (stol'berg), **Christian, Graf von,** a German poet; born in Hamburg, Oct. 15, 1748. Most of his poems were published with those of his brother Friedrich Leopold in 1779. He wrote two "choral plays," "Balthasar" and "Otanes" (1787); "Poems of Fatherland" (1815); "Poems from the Greek" (1782); and a translation of Sophocles (2 vols. 1787). He died in Windebye, Holstein, Jan. 18, 1821.

Stolberg, Friedrich Leopold, Graf von, a German poet and general writer, brother of Christian; born in Bramstedt, Holstein, Nov. 7, 1750. Some of his poems were published with those of his brother; separately he issued "Iambics" (1784), satires on the manners of the time. He translated the Iliad and some of Plato's "Dialogues," four of Æschylus's dramas, and "Ossian." In prose he wrote: "The Island" (1788), a romance; "Travels" in Germany, Switzerland, etc. (1794); "Life of Alfred the Great" (1815); "History of the Religion of Jesus Christ" (15 vols. 1806–1818). He died in Sondermühlen, near Osnabrück, Dec. 5, 1819.

FRIEDRICH VON STOLBERG.

Stole, a long, loose garment extending to the feet; also the sucker or shoot of a plant. In the Roman Catholic Church, a narrow band of silk or stuff, sometimes enriched with embroidery and jewels, worn on the left shoulder of deacons, and across both shoulders of bishops and priests, pendent on each side nearly to the ground;— used in the administration of the sacraments and all other sacred functions.

Stolon, in botany, a branch which, as of the currant, gooseberry, etc., naturally curves or falls down to the ground, where, favored by shade and moisture, it strikes root, and then forms an ascending stem, capable of drawing its nourishment directly from the soil, and, by the perishing of the portion which connects it with the parent stem, at length acquiring an entirely separate existence.

Stolp, a town in the Prussian province of Pomerania; on the river Stolp, 85 miles W. by N. of Danzig; has a castle, some old churches (the castle chapel dating from the 13th century), iron foundries, machinery, and amber manufactures, and an active trade in agricultural products, timber, fish, etc. Pop. 23,837.

Stolzite, a tetragonal mineral occurring mostly in octahedral forms; hardness, 2.7–3; sp. gr. 7.87–8.13; luster, sub-adamantine; color, gray, brown, red. Composition: Tungstic acid, 51.0; oxide of lead, 49.0 = 100, which is equivalent to the formula, PbO,WO_3. Found with molybdate of lead, at Bleiberg, Carinthia, and a few other places.

Stomach, in comparative anatomy, a membranous sac, formed by a dilatation of the alimentary canal, in which food is received and subjected to the processes of digestion among the Vertebrata. The human stomach is an elongated, curved pouch, from 10 to 12 inches long, and four or five inches in diameter at its widest part, lying almost immediately below the diaphragm, nearly transversely across the upper and left portion of the abdominal cavity, and having the form of a bagpipe. It is very dilatable and contractile, and its average capacity is about five pints. The left and larger extremity is called the cardiac, great, or splenic extremity; the right and smaller, is known as the pyloric, from its proximity to the pylorus. The food enters the stomach through the œsophagus by the cardia or cardiac orifice, and after having been acted on by the gastric juice, is passed on in a semi-fluid or pulpy state through the pylorus into the small intestines. The stomach has four coats, named from without inward: (1) the serous, (2) the muscular, (3) the areola or sub-mucous, and (4) the mucous coat. The last is a smooth, soft, rather thick and pulpy membrane, generally reddish in color from the blood in its capillary vessels; often ash-gray in old age. After death it becomes a dirty brown, and in acute inflammation, or from the action of strong acrid poisons, it becomes of a bright red, either continuously or in patches. Corrosive poisons also affect its coloration. The surface of the mucous membrane is beset with secreting glands. The stomach is supplied with blood from the cœliac artery, which gives off arterial branches that ramify freely, and the veins return the residual blood into the splenic and superior mesenteric veins, and directly into the portal vein. The lymphatics of the stomach are very numerous, and arise in the mucous membrane. The nerves are large, and consist of the terminal branches of the two pneumogastric nerves belonging to the cerbro-spinal system, and of offsets from the sympathetic system derived from

the solar plexus. Their ending has not been traced.

Owing to the recent improvements in electrical apparatus, the physiology and pathology of the human stomach in life is becoming much better known. Medical electricians have recently devised a plan by which the interior of the human stomach may be illuminated for examination. The patient is laid on the operating table and a slender tube, carrying a glass bead on its end, in introduced into the stomach. A small light inside the bead is supplied by fine wires running out through the tube and connected to a small battery. The interior of the stomach is plainly lighted and all its parts are brought into view by a small movable mirror at the end of the tube. In the lower mammals three forms of stomach have been distinguished: (1) Simple, consisting of a single cavity, as in man; (2) Complex, in which there are two or more compartments communicating with each other, as in the kangaroo, the porcupine, and the squirrel; (3) Compound, in which the stomach is separated into a reservoir and a digestive portion. (See RUMINATION). The family *Camelidæ* have a stomach divided into two compartments by a muscular band — one of the points of difference between them and the other ruminants. The lining of the second stomach, or honeycomb bag, and of a portion of the first stomach, or paunch, is provided with a great number of cells in which water is stored up and long retained for use in time of drought and of long journeys over the desert (see CAMEL).

In birds there are three small, but distinct dilatations of the alimentary canal, called the crop, gizzard, and proventriculus, and in most reptiles the simplicity of the œsophagus extends to the stomach. In fishes, two forms are found, the siphonal stomach and the cæcal, in which the upper portion gives off a long blind sac. In the higher Invertebrata, there is a digestive tract with functions analogous to those of the stomach of Vertebrates; in the lower there may (Hydra) or may not (Amœba) be a gastric cavity in which food is ingested and absorbed. In the latter case the living protoplasm closes over its prey, and after a time by a reversing process, the indigestible remains are ejected. To those tracts or cavities, the name stomach is often applied. See DIGESTION. The human stomach is subject to ulceration, cancer, cadaveric softening, perforation, catarrh, etc; besides which, chiefly through errors in food, and want of exercise on the part of the individual, it may fail in its proper function of digestion. See INDIGESTION.

Stomach Pump, in surgery, a suction and force pump for withdrawing the contents of the stomach in cases of poisoning, etc., and also used as an injector. It resembles the ordinary syringe, except that it has two apertures near the end, in which the valve opens different ways, so as to constitute a sucking and forcing passage.

Stomach Staggers, a disease in horses depending on a paralytic affection of the stomach. In this disease the animal dozes in the stable, and rests his head in the manger; he then wakes up and falls to eating, which he continues to do till the stomach swells to an enormous extent, and the animal at last dies of apoplexy or his stomach bursts.

Stomapoda, an order of crustaceans, having six to eight pairs of legs, mostly near the mouth (hence the name). They are found chiefly in intertropical climates, and are almost without exception marine. The order includes the locust shrimps (*Squilla*), the glass shrimps (*Erichthys*), and the opossum shrimps (*Mysis*).

Stomata, in botany, minute orifices or pores in the epidermis of leaves, etc., which open directly into the air cavities pervading the parenchyma, and through which exhalation takes place. In zoölogy the name is given to the breathing holes of insects or similar animals. They are situated along the sides of the body in insects.

Stomatella, in zoölogy, a genus of *Turbinidæ*, with 33 recent species found on reefs and under stones at low water in tropical and sub-tropical regions. Shell ear-shaped, regular spire small, aperture oblong, very large and oblique; interior pearly, lip thin and even, operculum circular, horny, and multispiral. They commence in the Secondary.

Stomatia, in zoölogy, a genus of *Haliotidæ*, akin to *Haliotis*, but with a prominent spire, and furrow instead of perforations on the shell. Recent species 12, found under stones at low water, from Java, the Philippines, Torres Straits, and the Pacific; fossil 18, from the Lower Silurian to the Chalk of North America and Europe.

Stomatitis, in pathology, inflammation of the mouth, a disease commonly occurring in young children. There are three forms of it; Follicular stomatitis, affecting the mucous follicles of the mouth; ulcerative stomatitis, attacking the gums, and gangrenous stomatitis, *cancrum oris*, or slough-in phagedæna of the mouth, affecting the tissues of the cheek.

Stomias, in ichthyology, the type genus of *Stomiatidæ*, with three species. Body elongate, compressed, covered with delicate deciduous scales; head compressed, snout very short, mouth cleft very wide; series of phosphorescent dots along the lower side of head, body, and tail. Specimens have been dredged at depths varying from 450 to 1,800 fathoms.

Stomiatidæ, a family of *Physostomi;* deep-sea fishes from the Atlantic, characterized chiefly by their formidable array of teeth. Skin naked, or covered with very delicate scales; eggs enclosed in the sacs of the ovarium, and excluded by oviducts. Dr. Günther enumerates the following genera: *Astronesthes,* with two dorsals, the posterior adipose; *Stomias, Echiostoma, Malacosteus* and *Bathyophis,* in which the rayed dorsal is opposite to the anal fin.

Stone, the material obtained from rocks; the kind of substance they produce. Also a gem; a precious stone. Something made of stone; as a monument erected to preserve the memory of the dead; a gravestone. Something which resembles a stone; as (*a*) a calcareous concretion in the kidneys or bladder; hence, the disease arising from a calculus (see CALCULUS); (*b*) the nut of a drupe or stone fruit; the hard covering enclosing the kernel, and itself enclosed by the pericarp; the hard and bony endocarp of a drupaceous fruit. The word is also applied to a measure of weight in use throughout the northwest and central countries of Europe, but varying much in different places. The English imperial standard stone is a weight of 14 pounds avoirdupois, but there are stones of other weights for particular commodities; thus the stone of butcher's meat or fish is 8 pounds, of cheese 16 pounds, of hemp 32 pounds, of glass 5 pounds, etc.

Stone is not used as a technical term in either petrology or geology, though it enters into the composition of words in those sciences, as Portland stone. By masons, builders, etc., it is continually used, and is specially contrasted with brick as material, for the construction of edifices. "That portion of it," says Weale, "which is used for building purposes is a dense, coherent, brittle substance, sometimes of a granulated, at others of a laminated structure, these qualities varying according to its chemical constitution and the mode in which it has been deposited." The qualities which render a building stone valuable are strength to resist superincumbent pressure, durability, and a capability of being easily wrought. The chief building stones in use are granites of various colors, elvans, syenites, porphyries, sandstones, millstone grit, dolomite, marbles, the mountain limestone and others. The art of working in stone is of great antiquity, the Egyptians being especially celebrated for their granite edifices, obelisks, sculptures, etc.

Stone, Artificial. Most varieties of artificial stone (using the term in a restricted sense, excluding brick and terra-cotta) have a base of hydraulic mortar, with which sand and pulverized stone of different kinds are mixed. Some years ago Mr. Ransome of Ipswich, England, introduced a kind of artificial stone in which siliceous instead of calcareous matter was employed as the cementing material. The process at present followed in the manufacture of this artificial stone consists in carefully mixing well-dried sand and dust of chalk with silicate of soda, obtained by digesting flints under pressure in a boiling solution of caustic soda. After molding, the blocks are exposed to the action *in vacuo* of chloride of calcium in a solution, where, by chemical reaction, the block is transformed into a silicate of lime, a body of unusual strength and durability. The other compound formed is chloride of sodium, or common salt, and is removed with water. The artificial stone of Sorel, a French chemist, is made by mixing a cement formed of the basic oxychloride of magnesium with sand, chalk, or powdered marble. The cement, which may be molded of itself into a hard stone, is procured by acting on protoxide of magnesium (calcined and ground carbonate of magnesia or magnesite) with a concentrated solution of chloride of magnesium. Sorel's process has been widely adopted in the United States, where calcareous and siliceous artificial stone is abundantly manufactured. The applications of artificial stone are very numerous; building blocks, flagstones, tiles, statuary, vases, architectural ornaments, grindstones, sewer pipes, are but a few of them; and in the breakwaters of Dover, Cherbourg, Port Said, and Cape Henlopen at the mouth of the Delaware, are examples of its suitableness for marine constructions.

Stone, Preservation of. Many processes have been devised for preventing the destruction of buildings and monuments by atmospheric influences, but as yet the results have not been entirely satisfactory. Fatty and oleaginous substances for filling the pores of the stone are efficacious only when renewed from time to time. Several inventors have employed mineral solutions with fair success. Kuhlmann chose an aqueous solution of silicate of potash (water glass), and applied it to the Louvre and the cathedral of Notre Dame in Paris. In the moist climate of England, however, water glass yields uncertain results, an unsightly efflorescence appearing on the surface of the stone. Fluosilicic acid washed with an alkaline solution, alumina soap, a silicate coated with asphaltum varnish, fuller's earth in diluted hydrofluoric acid, and an alkaline silicate washed with chloride of calcium solution, have all been suggested. The last-mentioned process, Ransome's patent, has so far received most favor. The silicate is brushed over the stone, and when it has dried the other solution is applied; double decomposition takes place, and an insoluble silicate of lime is precipitated in the pores of the stone, filling them up and thereby cementing together the particles of the stone.

Stone, Production of. The following table shows the production of the various kinds of stone in the United States in the calendar year 1900:

State.	Granite.	Sandstone.	Slate.	Marble.	Limestone.	Total.
Alabama	.....	$7,132	.....	$500	$533,608	$541,240
Arizona	.....	64,000	.....	5,000	165	69,165
Arkansas	$62,500	104,923	.....	.....	71,407	238,830
California	a738,993	200,090	$26,500	17,500	407,489	1,390,572
Colorado	143,054	119,658	.....	.....	160,587	423,299
Connecticut	a507,754	192,593	.....	.....	148,060	848,407
Delaware	608,028	.....	.....	.....	.....	608,028
Florida	.....	.....	.....	.....	128,381	128,381
Georgia	380,434	600	9,375	631,241	54,451	1,076,101
Idaho	2,450	438	.....	1,250	34,587	38,725
Illinois	.....	19,141	.....	.....	1,881,151	1,900,292
Indiana	.....	c36,513	.....	.....	2,344,818	2,381,331
Iowa	.....	19,063	.....	.....	586,410	605,473
Kansas	30,000	55,173	.....	.....	339,466	424,639
Kentucky	.....	56,178	.....	.....	178,252	234,430
Louisiana	.....	d118,192	.....	.....	.....	f118,192
Maine	1,568,573	.....	177,342	.....	691,312	2,437,227
Maryland	486,822	6,655	128,673	70,000	317,207	1,009,357
Massachusetts	a1,698,605	153,427	.....	130,735	209,359	2,192,126
Michigan	3,957	c132,650	.....	.....	425,636	562,243
Minnesota	221,684	267,000	700	.....	441,554	930,938
Missouri	139,103	53,401	.....	900	1,079,343	1,272,747
Montana	b9,091	59,630	.....	1,200	141,093	211,014
Nebraska	.....	.....	.....	.....	107,305	107,305
New Hampshire	870,646	.....	.....	.....	.....	870,646
New Jersey	a1,170,555	198,234	13,600	.....	170,006	1,552,395
New Mexico	.....	2,500	.....	4,500	.....	7,000
New York	a446,171	e1,467,496	62,755	332,518	1,730,162	4,039,102
North Carolina	257,962	27,210	.....	.....	(f)	285,172
Ohio	.....	c1,683,980	.....	.....	1,969,387	3,653,367
Oklahoma	.....	.....	.....	.....	25,586	25,586
Oregon	5,313	5,450	.....	.....	10,900	21,663
Pennsylvania	a396,271	ec1,043,321	2,713,598	151,167	3,800,318	8,104,675
Rhode Island	444,316	.....	.....	.....	16,828	461,144
South Carolina	500,802	.....	.....	.....	g38,415	539,217
South Dakota	114,115	12,675	.....	.....	47,762	174,552
Tennessee	.....	11,300	250	424,054	238,505	674,109
Texas	76,069	37,038	.....	.....	124,728	237,835
Utah	2,170	66,733	.....	.....	12,740	81,652
Vermont	1,113,788	.....	917,462	2,484,852	188,100	4,704,202
Virginia	211,080	6,000	190,211	.....	403,318	810,609
Washington	48,900	68,133	.....	11,836	249,163	378,032
West Virginia	.....	c65,615	.....	.....	53,701	119,316
Wisconsin	407,711	81,571	.....	.....	989,685	1,478,967
Wyoming	8,700	27,671	.....	.....	3,065	39,436
Total	a12,675,617	ce6,471,384	4,240,466	4,267,253	20,354,019	48,008,739

a Includes trap rock.
b Includes small amount of Nevada.
c Excludes value of grindstones and whetstones.
d Includes small amount for Mississippi.
e Includes bluestone.
f Included with South Carolina.
g Includes small amount for North Carolina.
The total production in 1909 was valued at $71,345,199.

Stone, Charles Pomeroy, an American military officer; born in Greenfield, Franklin co., Mass., in 1826; was graduated at the United States Military Academy and entered the army as lieutenant of ordnance in 1845; served with distinction in the Mexican War, and subsequently settled in California. At the breaking out of the Civil War he was the first volunteer officer sworn into the service; after a short period of military duty he was arrested and imprisoned in Fort Lafayette where he remained for a year; after his release he rejoined the army and went with General Banks up the Red River, serving till the end of the war; resigned from the army in 1864. He subsequently went to Egypt and served as chief of staff in the Egyptian army, receiving the title of pasha. He was an engineer and his last work was as engineer-in-chief in charge of the building of the pedestal of the Statue of Liberty in New York harbor. He died in New York city, Jan. 24, 1887.

Stone, Charles Wellington, an American educator; born in Templeton, Mass., Dec. 13, 1853; was graduated at Harvard University in 1874; founded a college preparatory school in 1879; and was secretary of the Handel and Haydn Society in 1890–1897. His publications include "Needles of Pine" (1886); school books; and essays on historical and educational subjects.

Stone, Edwin Martin, an American clergyman; born in Framingham, Mass., April 29, 1805; began his career as a printer in Boston. Later he was editor respectively of the "Times" and "Independent Messenger" in that city; was ordained in the Congregational Church; was pastor in Beverly, Mass., in 1833–1846; was engaged in mission work in Providence, R. I., in 1847–

Stone

1877; and during this time was instrumental in establishing several institutions including a Home for Aged Men. He was librarian of the Rhode Island Historical Society in 1848–1883, and was identified with other learned societies. He was the author of "Life of Elhanan Winchester" (1836); "History of Beverly, Mass., 1630–1842" (1843); "Life and Recollections of John Howland" (1857); "The Invasion of Canada in 1775"; "Our French Allies" (1883); etc. He died in Providence, R. I., Dec. 15, 1883.

Stone, Ellen M., an American missionary; born in Roxbury, Mass., July 24, 1846; received a public school education; settled in Chelsea, Mass., in 1860; became a teacher; and for 11 years was on the staff of the "Congregationalist." She went to Bulgaria as a missionary in 1878. About Sept. 1, 1901, with a companion, Mme. Tsilka, a native Bulgarian teacher, she was kidnaped by brigands who a few days later demanded an indemnity of $110,000, the money to be paid within 30 days. On Sept. 5, the news of Miss Stone's detention reached the United States, and her friends immediately notified the State Department at Washington and began a popular subscription to raise the required amount. The United States government communicated with the Bulgarian and Turkish authorities, who ordered troops to search for the retreat of the brigands for the purpose of releasing the captives. The troops were later ordered to cease pursuit, presumably at the instance of the United States, fear being expressed lest the presence of the soldiers would lead to the torture or murder of Miss Stone. More than one-half of the indemnity was raised by subscription, and it was intimated that the United States would guarantee the whole amount and afterward demand damages from the Turkish government for the outrage. On Feb. 6, $72,500 of the ransom demanded was paid, and on Feb. 23 Miss Stone was released.

Stone, Frank, an English genre painter; born in Manchester, England, in 1800. He painted at first in water-colors, and was for long a member of the old Water-color Society. His first important work in oil, the "Legend of Montrose," was exhibited at the Academy in 1840. Among his subsequent works are: "The First Appeal," "The Last Appeal," "Mated," "The Course of True Love," "The Gardener's Daughter." Most of his works have been engraved. He was elected A. R. A. in 1851. He died in London in 1859.

Stone, James Samuel, an American clergyman; born in England April 27, 1852; was graduated at the Philadelphia Divinity School in 1877 and at the Cambridge Theological School in 1880; was ordained in the Protestant Episcopal Church in 1877; and held pastorates in Toronto, Montreal, and Philadelphia in 1877–1895. In the latter year he became rector of St. James Church, Chicago. His publications include "Simple Sermons on Simple Subjects" (1879); "The Heart of Merrie England" (1887); "Readings in Church Histroy" (1889); "Necessity of Dogma in the Church" (1892); "Woods and Dales of Derbyshire" (1894); "From Frankfort to Munich" (1894); etc.

Stone, John Augustus, an American actor and dramatist; born in Concord, Mass., in 1801. He appeared on the stage in Boston, New York, and Philadelphia, and wrote many plays; among them "Metamora," "The Ancient Briton," and "Fauntleroy" for Edwin Forrest. He also published "The Demoniac," "Tancred," and "La Roque." He died in Philadelphia, Pa., June 1, 1834.

Stone, Lucy (Blackwell), an American reformer; born in West Brookfield, Mass., Aug. 13, 1818. She was graduated at Oberlin College in 1847. In 1855 she married Dr. Henry B. Blackwell, retaining her own name. She published a protest, "Taxation without Representation." In 1869 she helped organize the American Woman's Suffrage Association; became connected with the "Woman's Journal" in 1872, and was editor after 1888. Her lectures on woman suffrage made her known throughout the country. She died in Boston, Mass., Oct. 18, 1893.

Stone, Marcus, an English painter of historical genre, the son of Frank Stone; born in London, England, July 4, 1840; learned his art in his father's studio; exhibited his first picture in 1858 in the Academy, of which he became an associate in 1877, being elected an academician in 1887. Among his better-known pictures are: "Claudio accuses Hero" (1861); "On the Road from Waterloo to Paris" (1862); "Stealing the Keys" (1866); "Henry VIII. and Anne Boleyn" (1870); "Sain et Sauf" (Safe and Sound) (1875); "Il y en a toujours un Autre" (There's Always Another) (1882); "A Gambler's Wife" (1885); and "The First Love Letter" (1889).

Stone, Margaret Manson Barbour, an American author; born in St. Louis, Mo., Feb. 26, 1841; was graduated at the St. Louis High School; then studied languages and art. In 1885 she established and was made president of the Modern Novel Club. She was also the originator of public contests in housework in which prizes were given for neatness and quickness. Her publications include "The Problem of Domestic Service"; "One of Berrian's Novels"; "To Reading Clubs"; etc.

Stone, Marvin Chester, an American inventor; born in Portage co., O., in 1842;

was the inventor of a machine for making paper cigarette holders; a process for making paper "straws" for use with cold drinks; and a method of coloring china in imitation of the famous "peach-blow" vase. He was highly successful as a manufacturer and engaged extensively in philanthropic projects. He died in Washington, D. C., May 17, 1899.

Stone, Melville Elijah, an American journalist; born in Hudson, Ill., Aug. 22, 1848; settled in Chicago, Ill., and was there educated; began his newspaper career in 1864 when he reported for the Chicago "Tribune"; later with a partner he founded the Chicago "Daily News," of which he afterward became sole owner. In 1881 with Victor F. Lawson he founded the Chicago "Morning News" which subsequently became the Chicago "Record." Owing to ill health he retired from newspaper work in 1888 and spent several years abroad. Returning to the United States he settled in New York city, and was made general manager of the Associated Press.

Stone, Ormond, an American astronomer; born in Pekin, Ill., Jan. 11, 1847; assistant in the Naval Observatory at Washington (1876); Director of the Cincinnati Observatory (1875); and Professor of Astronomy and Director of the Observatory of the University of Virginia (1882). His principal astronomical work has been in the field of double-star observations and the discovery of nebulæ. He was editor of the "Annals of Mathematics," published at the University of Virginia.

Stone, William Leete, an American author; born in New Paltz, N. Y., April 20, 1792; became a printer in the office of the Cooperstown "Federalist" at the age of 17, and in 1813 began to edit the Herkimer "American." Subsequently he edited the "Hudson Whig," "The Lounger," Albany "Daily Advertiser," Hartford "Mirror," "The Knights of the Round Table" and the New York "Advertiser." His works include, "History of the Great Albany Convention of 1821"; "Tales and Sketches"; "Essays on Social and Literary Topics"; "Life of Joseph Brant"; "Life of Red Jacket—Sa-go-ye-wat-ha"; etc. He died in Saratoga Springs, N. Y., Aug. 15, 1844.

Stone, William Leete, an American historian, son of the preceding; born in New York city, April 4, 1835; was graduated at Brown University in 1858 and admitted to the bar in 1859. He was Centennial historian for the State of New York; honorary member of the Chicago, Buffalo, New Haven Colony, and other historical societies and organizations, and the author of "The Life and Times of Sir William Johnson, Bart.," "Revolutionary Leters," "History of New York City," "Ballads of the Burgoyne Campaign," etc. He died June 11, 1908.

Stone Age, or **Age of Stone,** is a term used in archæology to denote the condition of a people using stone as the material for the cutting tools and weapons which, in a higher condition of culture, were made of metals. The expression "age," when used in this connection, is not therefore significant of a fixed period in chronology, but implies merely the time, longer or shorter, earlier or later, during which the condition subsisted. The duration of such a condition must necessarily have varied from various causes in different areas, and chiefly in consequence of contact with higher degrees of culture. Populations placed in remote situations, and on that account remaining uninfluenced by such contact — like the islanders of the South Pacific and the Eskimos of the extreme North for instance — have remained in their stone age to the 20th century. On the other hand, the populations of the European area, in portions of which there were successive centers of high culture and civilization from a very early period, had all emerged from their stone age, through the use of bronze, many centuries before the Christian era.

The progress of early culture in Europe seems to have been from the South and East, N. and W., so that the emergence of the different populations from their age of stone was accomplished much earlier in Southern and Eastern Europe than in the North and West. But while the stone age of different areas is thus not necessarily synchronous, it seems to be true of all European areas that this is the earliest condition in which man has appeared upon them. Our knowledge of the details of the archæology of Asia, Africa, and America is still too limited for general conclusions to be drawn with certainty, but the existence of similar prehistoric conditions, as regards the use of stone prior to the introduction of metals in Asia Minor, India, China, Japan, the N. parts of Africa, and many parts of North and South America, has been fully established.

There are no data by which the period of the early stone-using populations of Europe can be defined, even approximately. But in England, Belgium, and France, and across the Continent to the shores of the Mediterranean, they were contemporary with animals which are now either wholly or locally extinct, such as the mammoth, wooly rhinoceros, cave lion, cave bear, and hyæna, the reindeer, musk ox, and urus. It is an open question to what extent this change of fauna implies a change of climate, but from the geological conditions in which the flint implements of the earliest types are found it is evident that, though extensive changes must have taken place since they

were deposited in the river basins, they belong exclusively to the later deposits of the Quaternary period.

The stone age implements of Europe have been divided into two classes — the palæolithic or older stone implements and the neolithic or newer stone implements. This is equivalent to dividing the stone age of Europe into two periods, earlier and later, as the palæolithic implements are found associated with the extinct and locally extinct fauna, while the neolithic implements are found associated with the existing fauna. The palæolithic stone implements are distinguished as a class from the neolithic by their greater rudeness of form, and by the facts that they are exclusively of flint and have been manufactured by chipping only. The neolithic stone implements on the other hand are of finer forms, often highly polished, and made of many varieties of stone besides flint. But the mere fact of an implement having been fashioned by chipping alone, is not decisive of its palæolithic character, because certain varieties of implements of neolithic time still continued to be made by chipping only. The distinguishing differences are the typical forms and the circumstances of association in which the implements are found. Palæolithic stone implements are found in their original situation in river gravels, in caves, and in association with bones of the extinct animals before mentioned. Neolithic stone implements are found in the surface soil, in refuse heaps of ancient habitations, and in chambered tombs. Implements of bone or deer-horn of both periods are similarly distinguished by their typical forms and their circumstances of association.

The palæolithic implements of flint are mostly so rude that it is impossible to apply to them names indicative of specific use. They are roughly chipped and destitute of that secondary working of finer character along the sides and edges which gives finish to the forms of the neolithic types. They present, however, a considerable number of well-marked typical forms. Those from the river gravels are chiefly flakes, trimmed and untrimmed, for cutting and scraping; pointed implements, some almond-shaped or tongue-shaped; and more obtusely pointed implements, with rounded and often undressed butts. There is also a series of scraper-like implements, and another of oval sharp-rimmed implements, which are more carefully finished than most of the other varieties. The flint implements from the caves present a greater variety of form. They are generally characterized by secondary working, and are therefore much more carefully finished, often in many respects approaching closely to neolithic types.

From the caves also come a series of implements of bone and of carvings on bone which have excited much astonishment on account of the extraordinary contrast between their artistic character and the extreme rudeness of many of the implements of stone with which they are associated. These bone implements consist of well-made needles, borers, javelin or harpoon points barbed on one or both sides, and implements of reindeer horn of unknown use (called by the French archæologists *batons de commandement*), which are usually carved in relief or ornamented with incised representations of animals, and occasionally of human figures. The animals, as for instance a group of reindeer from the cave of La Madelaine, Dordogne, are drawn with wonderful faithfulness, freedom, and spirit. In another instance, engraved on a flat piece of mammoth tusk is an outline representation of that animal showing its characteristic elephantine form and the covering of hair peculiar to the species.

The neolithic stone implements consist of axes and axe hammers, knives, daggers, spear and arrow heads, saws, chisels, borers, and scrapers. The axes and axe hammers are made of many varieties of stone besides flint. Some of the finer polished axes are of jade and fibrolite. The jade axes were once thought to have been importations from Eastern Asia, but the chippings of their manufacture have been found in the lake dwelling sites of the Lake of Constance, and deposits of the mineral itself were discovered about 1887 at Jordansmuhl, near Breslau, in Silesia. The axes are mostly imperforate. They are simple wedges, the butt end of which was inserted in the shaft, or in a socket of stag's-horn with a tenon on the upper end mortised into the shaft, though the shaft was sometimes put through a hole in the stag's-horn socket. The perforate stone axes, or axe hammers, which belong to the close of the stone age, had the hole for the shaft bored through them by a cylinder of wood or bone, working with sharp sand and water. Most of the other implements were made only of flint and generally finished by chipping, without being ground or polished. Some of the long Danish knives and daggers are marvels of dexterous workmanship, on account of the thinness of the blade and the straightness and keenness of the edge, produced by the mere process of chipping or removing successive flakes from the surface.

The burial customs of the stone age included both inhumation and cremation, the former being, however, the earlier method. No burials of the river drift period have yet been discovered. The cave dwellers of the stone age buried their dead in cavities of the rocks like that of Cro-Magnon in Dordogne, in which four or five skeletons were found huddled together, without being enclosed in cists or accompanied by sepulchral pottery. From a comparison of the

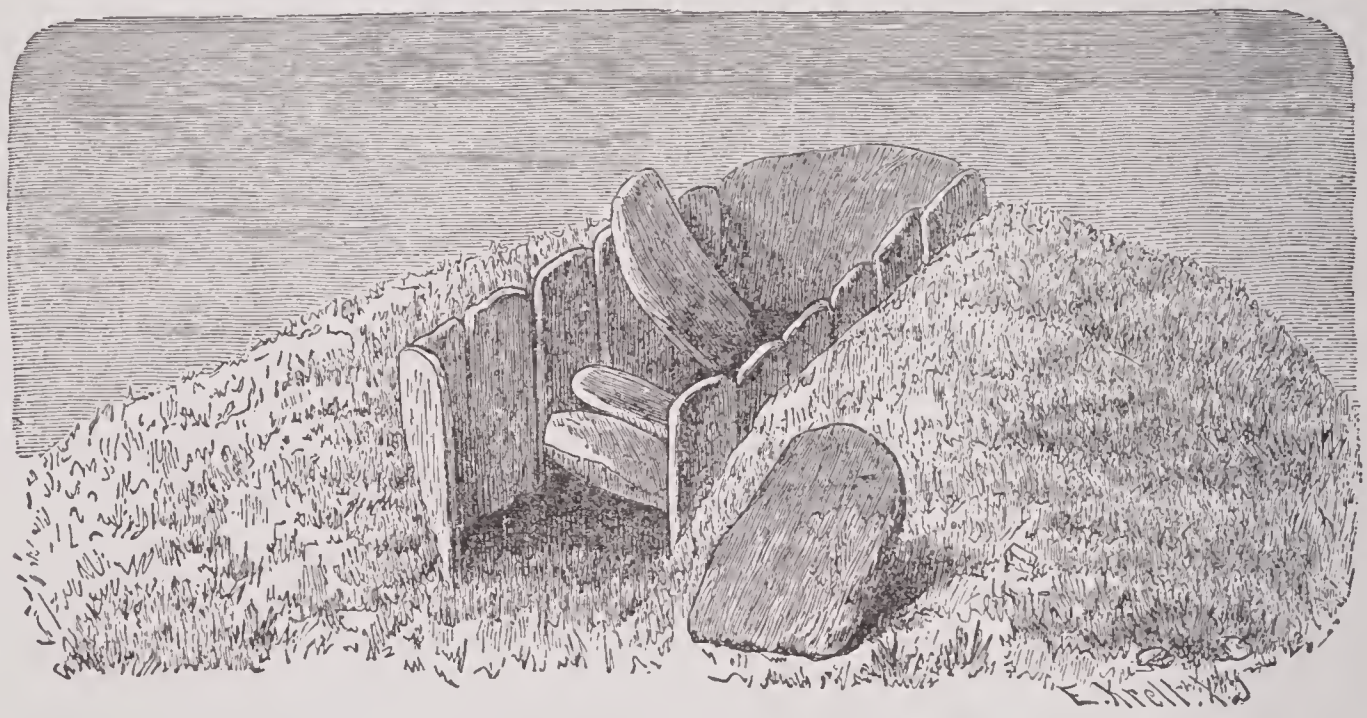
remains from such cave cemeteries in different localities it has been concluded that even at this early period Europe was already occupied by more than one race of men. The populations of the neolithic time deposited their dead, with or without previous cremation, in or on the floors of the chambers of dolmens, or great-chambered cairns. The sepulchral pottery accompanying these burials, in Britain at least, is generally of a hard-baked dark-colored paste, the form of the vessels mostly basin-shaped and round-bottomed, and the ornamentation entirely composed of straight lines placed at various angles to each other. The implements found with these interments are mostly of the commoner kind, such as flint knives, scrapers, or strikelights (used with a nodule of pyrites of iron), arrowheads, and more rarely axes and axe hammers of flint or polished stone. The neolithic inhabitants of North and Central Europe were not merely nomadic tribes subsisting on the products of the chase; they practised agriculture, and possessed the common domestic animals we now possess. The presence in the refuse heaps of their sea coast settlements of the remains of deep-sea fishes shows that they must have possessed boats and fishing lines, as was also the case with the stone age inhabitants of the lake dwellings. The estimates that have been made of the antiquity of the stone age in Europe are necessarily various, but it has been considered that the close of the neolithic period or the time when the use of stone began to be superseded by that of bronze in North Europe cannot have been much later than from 1000 to 1500 B. C. See LAKE DWELLINGS: STONEHENGE.

Stone Bramble, in botany, *Rubus saxatilis,* a bramble having the barren stems procumbent, unarmed, or with scattered bristles, trifoliate leaves, and very small petals. Found on the stony banks of subalpine and alpine rivers in Europe, and Asia to the Himalayas.

Stone Chat, an insessorial bird of the family of warblers, *Saxicola rubicola.* The

STONE CHAT.

stone chat is common in Europe, and frequents moors and other open wastes. Its color on the upper part generally is black,



STONE GRAVE IN SWEDEN.

the belly is yellowish white, and the breast a light chestnut brown. It runs with much celerity. It is accidental in the N. part of North America.

Stone Circles, or **Circles of Standing Stones,** popularly, but erroneously called Druidical Circles in Great Britain, Domrings, or Thing-steads in Scandanavia, and known as Cromlechs in France, consist of unhewn stones set up at intervals round the circumference of a circular area usually of level ground, though they are sometimes found on the slightly sloping side of a hill. The area thus marked off from the surrounding ground varies in size from less than 20 to more than 100 feet in diameter. The number of stones composing the circle also varies greatly, but as most stone circles exist now in a condition of greater or less dilapidation it is often impossible to ascertain with certainty what the original number may have been. Sometimes they are

Stone Circles

mere bowlders rolled into position, at other times they are pillar stones, evidently chosen for their length, and wedged upright by smaller stones inserted round their bases in the cavity in the subsoil prepared for their reception. Sometimes there is a single circle only, at other times one or two smaller circles are contained concentrically within the interior circle.

Occasionally the area on which the circle stands is further marked off from the surrounding ground by a trench, or by a trench and rampart of earth surrounding the whole, except where a narrow pathway gives access to the interior on the original level. In the district of Scotland between the Dee and the Spey there are numerous examples of a special variety of stone circle distinguished by the presence of a great flat block placed on edge so as to fill one of the intervals between two of the upright pillars, usually on the S. W. side of the circle. Circles of small bowlder stones placed close together and scarcely showing above the turf are also found in many parts of Europe, indicating that the space thus enclosed has been reserved for burial deposits in prehistoric times. But the circles composed of large stones set at considerable intervals apart are linked with the burial customs of the builders of the chambered cairns of the stone age. A great circle of standing stones encircled the gigantic chambered cairn of New Grange in Ireland, and the smaller cairns of Clava in Strathnairn, near Inverness, are similarly encircled by pillar stones.

As a rule the cairns which covered the cremation interments of the bronze age are smaller than those of the preceding period, and the custom of placing the burnt bones in a cavity in the soil, covered only by an inverted urn of clay, dispensed with the cairn altogether, while it retained the circle of standing stones as a visible mark or fence of the grave ground. In about 20 instances in which there has been systematic excavation of stone circles in Scotland the examination of the interior space has disclosed burials of the bronze age mostly after cremation but occasionally unburnt. The cremated remains were deposited with cinerary urns placed either in an inverted position over the burnt bones or upright and containing the burnt bones, at the bottom of a shallow pit excavated in the subsoil. These cinerary urns exhibit the forms and ornamentation characteristic of the age of bronze. Sometimes the burials have been placed in cists of unhewn slabs of stone, covered by small cairns of loose stones, underneath the surface level; at other times the burnt bones of many burials have been found placed in shallow cavities excavated in the soil of the interior area of the circle near the bases of the upright stones. From these circumstances it is conclusively demonstrated that the common varieties of stone circles in Scotland are circular cemeteries of bronze-age burials. It may be that the greater circles, like those of Stennis, Avebury, and Stonehenge, may have had a different origin and purpose, but there is no evidence more conclusive than mere conjecture for the assumption of a different purpose for the larger circles, and the great size of the circle surrounding the immense chambered cairn of New Grange shows that a great circle was associated with sepulture.

The largest of the Scotch stone circles is that of Stennis, in Orkney, standing on the slope of the hill overlooking the loch of that name about 4 miles N. E. of Stromness. It is surrounded by a trench 30 feet wide and about 6 feet in depth, enclosing a total area of about 2½ acres. The trench is crossed by two accesses to the enclosed area on opposite sides of the circle, each 17 feet wide. The circle of pillar stones stands 13 feet within the trench on a circumference of 340 feet in diameter. The original number of pillar stones was probably 60, of which only 13 are now standing; 10 are prostrate, and the stumps or fragments of 13 more are still recognizable. The highest stone standing is 14 feet in height, and several of those now prostrate exceed 12 feet in length. The average distance between the stones is about 17 feet. A smaller circle, which seems, however, to have been composed of larger stones, stood about a mile to the S. Its whole interior area is raised about 3 feet above the surrounding level, and has had a circumscribing ditch, with a rampart on the inner side. Only two stones remain standing, and a somewhat larger one, now prostrate, is 19 feet long and 5 feet broad. It was near this circle that the perforated stone stood, through the aperture of which it was the custom in the 18th century for young men and women of the district to plight their troth by joining hands, a promise of marriage thus made being regarded with superstitious reverence as specially binding.

The largest stone circle in England is that of Avebury, in Wiltshire. This monument is apparently alluded to in a charter of King Athelstan, dated A. D. 939, where one of the boundaries is said to run "from the road to Hackpen northward up along the Stone Row, thence to the burying place." Stonehenge, the most famous of British stone circles, stands within a ditch and embankment enclosing an area of about 360 feet in diameter. It differs from other stone circles not only in its ground plan, but in the pillar stones of the exterior circle and the larger ellipse surmounted by imposts, mortised on tenons in the tops of the uprights, and also by the larger stones be-

ing thus at least partially tool-dressed. In Norway and Sweden the few stone circles systematically explored have been found to be burial places of the iron age. They are usually simple circles composed of 8 to 13 stones; occasionally there are two concentric circles, one within the other, the inner circle being sometimes composed of small stones set close together in a ring. Sometimes there is a single pillar stone in the center of the circle. As a rule they are not remarkable either for the size of the circles themselves or for the massiveness of the stones of which they are composed. Circles of standing stones are rare to the S. of the Baltic.

In France they are comparatively few in number, and scarcely anything is yet known of their contents. In Algeria megalithic circular burial places are not uncommon, but they do not correspond in general with those of Northern Europe, being rarely composed of pillar stones. Circles of pillar stones, apparently of comparatively recent origin, have been found in Northern India, and megalithic circles are stated to have been occasionally met with E. of the Jordan, and in Northern Arabia. See STANDING STONES.

Stone Coal, a name applied in the United States and England to anthracite, but in Germany it is used to distinguish the coal of the carboniferous formation from the more recent lignites or brown coals (German *braunkohle*) of the Tertiary period. See COAL.

Stone Fly, the *Perla*, a genus of insects typical of the order *Plecoptera*. The hind wings are broader than the fore wings, and folded at the inner edge. The body is elongated, narrow, and flattened; the wings fold close to the body, which generally bears two terminal bristles. The larvæ are aquatic, and much resemble the perfect insect, except in the absence of wings. A number of species — *e. g., P. bicaudata* — are common in Great Britain, and are well known to anglers as an attractive lure for fishes.

Stone Fruits, a name popularly applied to those fruits in which the single kernel is enclosed in a stone, and this enveloped in an edible pulpy mass covered by a thin skin. Examples are found in the cherry, peach, plum, olive, etc. Botanically this kind of fruit is called a drupe, the skin being the epicarp, the pulp the mesocarp, and the hard shell of the seed the endocarp.

Stoneham, a town in Middlesex co., Mass.; on the Boston and Maine railroad; 12 miles N. by W. of Boston. It contains a high school, a National bank, public library, and several weekly newspapers. It is celebrated for its shoe and leather industries. It also has a box factory, machine shop, etc., and an assessed property valuation exceeding $5,000,000. Pop. (1890) 6,155; (1900) 6,197; (1910) 7,090.

Stonehenge, a very remarkable structure composed of large artificially raised monoliths, situated on Salisbury Plain, in Wiltshire, England. The ancient Britons called it Main Ambers, or "sacred stones." The spot is surrounded by a ditch 50 feet wide; the outer circle consisted of 60 stones, 30 perpendicular, 20 feet high and nearly four feet apart. On the tops of these were 30 imposts, regularly united; within this was a second circle of 40 stones, smaller and void of imposts. There are indications of two ovals of stones intervening. Within the second circle was a cell, or adytum, in which was the altar, a huge slab of blue marble. The whole structure consisted of 140 stones. So many of these enormous stones have fallen that the general appearance has become wild, and presents a stupendous pile of dilapidation; yet, by walking round and clambering amid the prostrate masses, the original design may

STONEHENGE.

be traced. There are three entrances from the plain. The whole is surrounded by a bank of earth 15 feet high and 1,010 feet in circumference. Though much weather-worn, the sharp angles of many of the stones, together with the tenons and mortises by which they were joined, are well preserved. Out of the stones composing the outer circle, 17 remain; in the inner circle 8 are entire, and fragments of 12 others are on the spot. The average elevation of the stones is 14 feet, the breadth 7 feet, and the thickness 3 feet. The inner oval consisted of about 20 smaller stones, of which 11 are standing. The other oval contained 10 stones, of which 8 are now remaining. Scattered over the plain are about 300 tumuli, or barrows. These, when opened, have been found to contain charred human bones. Accompanying weapons and implements show that they have been utilized both by Britons and Romans for interment. When this marvelous collection of monoliths and trilithons was brought together

is uncertain, as is also the purpose it was intended to serve.

In 1901, one of the great monoliths fell and was set up again. Excavations then made at the base, brought to light the stone implements originally used in cutting the monoliths. This seems to place the erection of Stonehenge before the bronze age, and the inference is that the structure is about 3,400 years old. See STANDING STONES: STONE WORSHIP.

Stoneman, George, an American military officer; born in Busti, N. Y., Aug. 8, 1822; was graduated at the United States Military Academy in 1846; served on the Pacific coast in 1847–1857; was promoted captain in 2d Cavalry in the latter year and was on duty principally in Texas till 1861. While in command of Fort Brown in the early part of the year he refused to surrender the government property to the Confederates at the order of Gen. David E. Twiggs. He was, however, compelled to evacuate the fort and sailed to New York. In August, 1861 he became Brigadier-General of volunteers and chief of cavalry in the Army of the Potomac. He commanded the cavalry in the Peninsular campaign of 1862, and distinguished himself in the battle of Williamsburg on May 5 of that year; was promoted Major-General of volunteers in the following November. He participated in the raid toward Richmond in April–May, 1863, and in the Atlanta campaign in May–July, 1864. He was taken prisoner in Clinton, Ga., in July of that year and held till October. Afterward till the end of the war he performed important service in Southwestern Virginia, Tennessee, and North Carolina. He was promoted colonel of the 21st Infantry in July, 1866, and was brevetted Brigadier-General and Major-General U. S. A., in recognition of his meritorious services. In August, 1871 he resigned from the army and settled in California, of which State he was Democratic governor in 1883–1887. He died in Buffalo, N. Y., Sept. 5, 1894.

Stone Ocher, an earthy oxide of iron which forms a yellow pigment of considerable permanence in oil or water-colors.

Stone Plover, a large species of plover, the *Œdicnemus crepitans.* It appears in England at the latter end of April, frequents open hilly situations; makes no nest, but lays two eggs on the bare ground, and emigrates in small flocks about the end of September. Called also stone curlew and thickknee.

Stones, Precious, numerous mineral substances, and one or two products of organic origin, used in jewelry and for other ornamental purposes on account of their rarity and beauty. The list of stones which may be regarded as precious cannot be definitely limited, as certain substances appear and disappear with the fluctuations of fashion. Some confusion also arises from the commercial application of the same name to several substances which may have a superficial similarity, though they really belong to distinct mineral species. Further, in point of beauty and rarity, the mineral substances used for ornament so merge into the common and abundant that there is no possible dividing line between precious and common stones. Among the substances used ornamentally, however, there are a few which from all times have occupied a foremost place and have been universally prized as precious stones. In such a rank and position may be placed the diamond, the ruby, the sapphire, the Oriental amethyst, and the emerald, as well as, in a lesser degree, the tourmaline, the aquamarine or pale emerald, the chrysoberyl or cat's eye, the zircon or jargoon, the opal, and the varieties of quartz, such as rock-crystal, agate, amethyst, cairngorm or Scotch topaz, chalcedony, jasper, onyx, sardonyx, etc. Among other beautiful and valuable stones much appreciated for ornamental purposes, but scarcely to be classed as precious stones, there may be included lapis lazuli, crocidolite, labradorite, moonstone, avanturine, and malachite. To the list of precious stones there should be added two substances of animal origin — pearls and red coral — and perhaps also amber, a comparatively rare and valuable fossil resin. The various substances here enumerated are dealt with, for the most part, under their own proper names.

For the development of the sparkle, luster, and glow of color of most precious stones it is essential that they should undergo the process of cutting and polishing. When luster and sparkle are the principal qualities to be revealed, as in the case of the diamond, the surface is most favorably cut into numerous plane facets as either brilliant or rose cut stones. When color is the more important quality of the stone it may, if plane surfaces are wanted, be step or table cut. Such stones also, and translucent and opaque stones, may be cut *en cabochon* — *i. e.*, with curved or rounded surfaces. The varieties of cabochon cutting are single cabochon, or high plano-convex double cabochon, and double convex and hollow cabochon, the latter being much used for large garnets, which so cut are called carbuncles.

One of the most important qualities of a precious stone is its hardness, as on that property depends its power of resisting wear and of keeping the brilliance of its polished surface. It is a property of great constancy, moreover, and in many cases affords a ready means of determining the nature of a stone under examination. Of

all known substances diamond is the hardest, and representing it, according to Mohs's scale, by 10, the following is the relative hardness of several of the more important of the precious stones: Diamond, 10.0; sapphire, 9.0; ruby, 8.8; chrysoberyl, 8.5; spinel, 8.0; topaz, 8.0; aquamarine, 8.0; emerald, 7.8; zircon, 7.8; tourmaline, 7.5; amethyst, 7.0; moonstone, 6.3; turquoise, 6.0; opal, 6.0. See BRILLIANT: DIAMOND.

Production.—The following table shows the production of precious stones in the United States in the calendar year 1900:

Diamond	$150
Sapphire	75,000
Ruby	3,000
Topaz	None.
Beryl (aquamarine, etc.)	11,000
Emerald	4,000
Phenacite	None.
Tourmaline	2,500
Peridot	500
Quartz, crystal	10,000
Smoky quartz	1,000
Rose quartz	100
Amethyst	500
Prase	None.
Gold quartz	2,000
Rutilated quartz	50
Dumortierite in quartz	None.
Agate	1,000
Moss Agate	1,000
Chrysoprase	100
Silicified wood (silicified and opalized)	6,000
Opal	None.
Garnet (almandite)	500
Rhodolite	20,000
Garnet (pyrope)	1,000
Topazolite	None.
Amazon stone	250
Oligoclase	20
Moonstone	None.
Turquoise	82,000
Utahlite (compact variscite)	100
Chlorastrolite	3,000
Nesolite (thomsonite, so called)	1,000
Prehnite	50
Pyrite	2,000
Malachite	200
Rutile	100
Anthracite	2,000
Catlinite (pipestone)	2,000
Fossil coral	50
Arrow points	1,000
Total	$233,170

(Value of 1909 production, $534,380.)

Artificial Precious Stones.—Numerous attempts have been made by eminent investigators to produce artificial precious stones by means of intense heat and pressure and by electrical action; but hitherto these efforts have failed of practical success. In an important memoir published by Sainte Claire Deville and Caron in 1858, they describe various processes by which they obtained small crystals of corundum, ruby, sapphire, etc. By the action of the vapors of fluoride of aluminum and boracic acid on one another, they obtained crystals which, in hardness and in optical properties, resembled natural corundum. When a little fluoride of chromium was added a similar process yielded violet-red rubies; with rather more fluoride of chromium blue sapphires were yielded; and with still more green corundum was obtained. A mixture of equal equivalents of the fluorides of aluminum and glucinum, when similarly acted on by boracic acid, yielded minute crystals of chrysoberyl. The action of fluoride of silicon on zirconia yields small crystals of zircon, and by the action of silica on a mixture of the fluorides of aluminum and glucinum hexagonal plates of extreme hardness were obtained, which in some respects resembled emerald.

In subsequent researches Becquerel, by the use of electric currents of high tension, succeeded in obtaining opals, etc., from solutions of silicates. Among the most successful of experimenters in this direction was the late Ch. Feil, of Paris, who successfully crystallized alumina, and by the introduction of coloring matter produced sapphires and rubies identical in hardness and composition, but not in brilliance, with the natural stones. M. Feil also succeeded in preparing true crystals of spinel, and a blue lime spinel of great hardness, but which were glassy rather than crystalline in structure.

Imitations of precious stones consist of a soft, heavy flint-glass called strass, or paste, appropriately colored, and they may readily be distinguished, among other peculiarities, by their great softness. Fraudulent combinations are made by cementing thin plates of precious materials over, and sometimes under, a body of valueless glass, and thus also the exposed surface or surfaces when tested are real stones, and the veneered mass passes as a genuine large and consequently valuable possession.

Stonesfield Slate, in geology, a slaty calcareous limestone, forming a constituent portion of the lower oölite formation, and abounding in organic remains. In it were first detected mammalian remains of the secondary epoch.

Stonewall Jackson, a name given to Gen. T. J. Jackson during the Civil War. See JACKSON, THOMAS J.

Stoneware, a very hard kind of pottery, with which are made jars, drain pipes, and a variety of chemical untensils. It is constituted of plastic clay, united in various proportions with some felspathic mineral sands of different kinds, and in some cases with cement, stone, or chalk. These mixtures are then subjected to a heat sufficiently great to cause a partial fusion of the mass. This condition of semi-fusion is the distinguishing character of stoneware. The finer varieties of stoneware are made from carefully selected clays, which when burnt will not have much color. These are united with some fluxing substance, by which the particular state of semi-fusion above mentioned is brought about. Formerly the glaze of stoneware was always a salt glaze; recently, however, a mixture of stone, flint, etc., has been used. See POTTERY.

Stone Worship, divine honors paid to stones either as the embodiments or the representatives of deities. It is a part of stock-and-stone worship, dating from remote antiquity, and was once widespread. Grote notes that it existed among the ancient Greeks; Tacitus describes a conical pillar which stood instead of an image to represent "for an unknown reason," the Paphian Venus; and Isaiah lvii: 6 shows that it was not unknown among the Jews. It lingered on in France and Europe till the Early Middle Ages, in Norway till the end of the 18th century, and, according to Lord Roden ("Progress of Reformation in Ireland"), the islanders of Inniskea, off the coast of Mayo, worshiped a stone, and whenever a storm arose besought it to send a wreck on the coast. Tylor, coupling the fact that stone worship survived to the Early Middle Ages in England and France with the circumstance that groups of standing stones are set up in India to represent deities, suggests "that menhirs, cromlechs, etc., may be idols, and circles and lines of idols, worshiped by remotely ancient dwellers in the land as representatives or embodiments of their gods."

Stonewort, any plant of the order *Characeæ* (*q.v.*). See also CHARA.

Stonington, a town in New London co., Conn.; on the Long Island Sound, and on the New York, New Haven, and Hartford railroad; 43 miles S. W. of Providence, R. I. It comprises the borough of Stonington and the villages of Pawcatuck, Mystic, and Old Mystic. There is an excellent harbor, and regular steamboat connection with New York and Boston. Here are a public library, an English and Classical Institute, high schools, a National bank, and a semi-weekly newspaper. The town has important manufactories, including silk, cotton, and woolen goods, printing presses, spools, boilers, iron and brass goods, etc. The assessed property valuation is nearly $3,500,000. In August, 1814, the inhabitants successfully defended the town against a British attack. Pop. (1890) 7,184; (1900) 8,540; (1910) 9,154.

Stonyhurst, a Roman Catholic college in Northeast Lancashire, England, 4 miles S. W. of Clitheroe. It traces its origin to the seminary at St. Omer, in France, founded in 1592, by Father Parsons. The seminary ere long had 200 students, but after many vicissitudes was suppressed by the tyranny of the Bourbons in 1762. After a short sojourn at Bruges till 1772, and at Liége till 1794 (when the French Revolutionary armies were closing round it), the 18 Jesuit fathers were offered a resting place at Stonyhurst by Mr. Weld of Lulworth, an old alumnus, to whose family the old home of the Shireburnes had in 1754 passed by marriage. The fine house, begun about 1594, was beginning to fall into ruin, and even when restored provided but scant accommodation for the 200 students who soon flocked to it. Extensions were made in 1810–1878, the chapel being built in 1835, and other additions have been lately completed. The numbers have gone on increasing with some fluctuations, and are now about 300. The teaching staff numbers over 30 masters; and there is a preparatory school at Hodder, a mile distant. The department for higher education prepares young men for the London University degree and competitive examinations, and puts them through a course of philosophy. In 1840 Stonyhurst was affiliated to the University of London, and it has a long list of successes in the various examinations, especially classics. The course is mainly classical, but mathematics receives a large share of attention; and French, science, and other branches are essential parts of the course. Games are much encouraged, and special forms of football and handball seem to have been brought from St. Omer. The library of some 40,000 volumes has many valuable MSS. and early printed books; and the college possesses a collection of pictures, a museum of antiquities, scientific collections, and fine specimens of embroidery and church plate in the sacristy (many of these treasures having been preserved from St. Omer days). The college observatory rose into some note under Father Perry, F. R. S.

Stony Point, a small rocky promontory on the W. bank of the Hudson river, opposite Verplanck's Point, 42 miles N. of New York city, at the entrance to the Highlands. A fortification of some importance in the Revolutionary War, it was captured and strengthened by the British, but was recovered in a night attack by Wayne. It is connected by a marsh with the shore, and supports a lighthouse and fog-bell tower. In the village here is the house where Benedict Arnold held his treasonable interviews.

The property at Stony Point, consisting of 34 acres, has been acquired by the State for a public park, $25,000 having been appropriated for that purpose by the legislature in 1897. With this amount the site of "Mad" Anthony Wayne's midnight attack has been bought and many improvements made. The locality has been made accessible to the public, the Revolutionary fortifications have been properly marked, and the custody of the park has been given to the American Scenic and Historic Preservation Society. It is chiefly through the zeal shown by this society that the acquisition of the property by the State was assured, and Stony Point will now hold a more prominent rank in the Hudson river landmarks than it has in the past.

Storage Battery

Storage Battery, an electric battery that discharges a secondary current; also called accumulator. A series of metallic or other conducting plates, usually lead, are divided from each other by a non-conducting substance, the whole being immersed in a water solution. Through this solution a primary current is sent from the negative to the positive, decomposing the water, its oxygen forming with the lead on the positive pole a peroxide of lead, and leaving a deposit of metallic lead on the negative plate, the oxide then being destroyed by the hydrogen. When the primary discharge from the negative to the positive pole is stopped, the chemical affinity of the oxygen in the peroxide of lead for the metallic lead causes it to leave the positive for the negative pole, thereby causing a current from the positive to the negative pole, which is utilized as a primary current. The history of the storage cell is essentially that of the lead cell discovered by Planté in 1860, in which lead strips were immersed in dilute sulphuric acid to produce a secondary current. It was demonstrated that with each charge and discharge the secondary current strengthened, and that by charging reversely there was a further gain. This ability to deliver a secondary current at a later time is termed storage capacity. The Faure battery, introduced in 1881, was of quicker operation. Faure covered the lead plates with lead oxide and passed the current through. This decomposed the oxide in one plate, leaving a coating of porous spongy metallic lead; on the other plate the oxide was converted into lead peroxide. In this manner the electrical energy was converted into chemical energy, and the battery could be used to give off a secondary current at a later period, this current approximating the strength of the charging current. In the early storage batteries the plates of the cells were of similar construction, but now usually they are slightly different. The opposed plates or grids are sheets of lead, etc., full of holes, which holes contain the active material, that is to say, in a lead battery the metallic sponge lead for the negative and the lead peroxide for the positive plate. The principal use of the storage battery is in connection with electric light and power plants, where it serves to carry the extra load of work during rush hours. For instance, the steam engines and dynamos of a street-car power plant are running during dull hours, and delivering unused or surplus electric current to the batteries, or accumulators, as they are sometimes called. When there is an increase of car traffic, say from seven to nine in the morning, the storage batteries give up part of their stored energy and assist the dynamos in carrying the extra load. In this way a light or power plant can handle for a short time twice or three times as many lights or cars as it is designed to operate normally. The direct current is used for charging batteries, as the alternating current is unsuitable. There has been a large expenditure of money in adapting the storage battery to operate street cars direct, but the system has been a failure. Boats, called electric launches, are operated by storage batteries with some success. Electric automobiles also make use of the storage battery, and these have obtained some popularity, though the excessive weight of the batteries, owing to the use of lead plates, has been a deterrent factor. Much difficulty has been met with in the endeavor to reduce weight for a given energy-storage capacity without detriment to endurance, and this weight is the great drawback in electric storage battery traction. The ordinary battery weighs from 124.5 pounds to 186.5 pounds per horse-power hour. While it is possible to increase the energy per unit mass by making the electrodes very light, this has usually been found to be followed by heavy deterioration. Many attempts have been made to perfect storage cells of the alkaline-zincate type, but the great difficulty of depositing zinc in coherent form from the solution, as well as the lack of a depolarizer that shall be insoluble in the electrolyte, has stood in the way of this cell's success. Thomas A. Edison's light-weight battery is built to meet the demand for reduced weight. The negative pole or positive element of Edison's cell, corresponding to the zinc of a primary cell or the spongy lead of a secondary cell, is iron. The positive pole or negative element, corresponding to the carbon of a primary cell or lead peroxide of a secondary cell, is a superoxide of nickel, believed to have the formula NiO_2. The cell is, therefore, nickel-iron. The electrolyte is potash, viz., an aqueous solution containing 10 per cent. to 40 per cent. by weight, but preferably 20 per cent. of potassium hydroxide. In practice with the ordinary storage battery the storage energy per unit mass of the modern lead battery is from four to six watt hours per pound of battery; but the storage capacity of the Edison cell per unit of total mass of steel is claimed as 14 watt hours per pound. Expressing the same statement in another way, the weight of the battery per unit of initial energy at the terminals is 53.3 pounds per E. H. P. hour. The normal discharge period is 3½ hours. The cell may be discharged at a relatively high rate in approximately one hour. Charging and discharging rates are alike. That is to say, the cell may be charged at the normal rate of 3½ hours, or it may be charged at a relatively high rate in one hour with no great detriment beyond a somewhat lower electrical efficiency.

The positive and negative plates can

scarcely be distinguished. They differ only in the chemical contents of their pockets. The cell is called an "oxygen lift," because the electrolyte lifts or transports the oxygen from one plate to the other. Charging pulls the oxygen away from the iron and delivers it temporarily to the nickel. The condition is then stable, till the circuit of the cell is completed. The discharge then allows the oxygen to fall back from the nickel to the iron with the natural affinity of iron and oxygen. This action is very different from that which takes place in the lead storage cell. In the new Edison cell the theoretical action of the potash solution is merely to provide the proper channel through which the oxygen ions may travel in one direction or the other—positive plate to negative plate in charge, and negative plate to positive plate in discharge.

In the early days of storage batteries many efforts were made to secure plates that would not break down nor buckle with use. It has come to be appreciated that the plates must not be expected to last indefinitely, like the iron framework of a machine, because they are being used up by the continual action of the electric current, and one cannot accomplish any mechanical result without subjecting the mechanism to wear or destructive action of some kind. In practical operation storage batteries are expected to deliver 75 to 90 per cent. of the current with which they have been charged. The capacity of a battery, or of a cell in a battery, is measured by the number of ampere hours it can give in discharging, and this is the feature by which it is bought and sold, just as a steam-engine is bought and sold on its horse-power capacity. All lead storage batteries give a greater capacity discharge when the discharge is low, as a high rate of discharge causes the active material on the surface of the plates to become sulphated, thus resisting the action of the acid on the material. While the vast majority of storage batteries are made with lead plates, and Edison's is nickel-iron, it must not be inferred that these are the only metals employed. Copper-zinc plates have been used in an aqueous solution of caustic potash, the negative plate being metallic zinc and the positive cuprous oxide. Such batteries have the disadvantage that the zinc tends to deposit unevenly and in lumps, and that the cuprous oxide formed by overcharges is slightly soluble. Further, the P. D. (difference of potential between the cells) is only 8 volts. The zinc-lead battery, on the other hand, has a very high P. D. (2 to 2.25 volts). Sulphuric acid is used with it as the electrolyte. Lead-zinc batteries give trouble in dissolving, but are useful where weight is no objection, and where low currents are employed. See Battery; Cell; Electricity.

Charles H. Cochrane.

Storer, David Humphreys, an American physician and naturalist; born in Portland, Maine, March 26, 1804. He practiced medicine in Boston from 1825, and held chairs in the Tremont Street Medical School, which he founded, and the Harvard Medical School, of which he was dean in 1855-64. He was associated with Louis Agassiz in researches in natural history, and published a "History of the Fishes of Massachusetts" (1853-67). He died in Boston, Sept. 10, 1891.

Storer, Francis Humphreys, an American chemist, son of David H. Storer, (*q. v.*); born in Boston, Mass., March 27, 1832. He studied chemistry at the Lawrence Scientic School in 1850-51, in Europe in 1855-57, and followed his profession in Boston in 1857-65. He held the chair of industrial and general chemistry at the Massachusetts Institute of Technology in 1865-70. In the latter year, he became professor of agricultural chemistry at the Bussey Institution, Harvard University. His publications include: "Dictionary of the Solubilities of Chemical Substances" (1864); "Manual of Inorganic Chemistry" (1869); "Manual of Qualitative Chemical Analysis" (1868); "Agriculture in Some of Its Relations with Chemistry" (1897).

Storey, George Adolphus, an English painter; born in London, Jan. 7, 1834. He was educated in Paris and London and first exhibited at the Royal Academy in 1852. In 1863 he was in Spain, painting portraits at Madrid. Among his pictures are: "A Royal Challenge" (1865); "After You" (1867); "The Shy Pupil" (1868); "The Old Soldier" (1869); "Only a Rabbit" (1870); "A Dancing Lesson" (1876); "The Old Pump-room, Bath" (1877); "First Practice" (1894); "Rival Minstrels" and "Coming Events" (1895); "A Love Stratagem" (1896); "A Fair Musician" (1897); "Daughter of the Regiment" (1897); "In Evening Shade" (1898); "Pamela" (1906). He was elected an A. R. A. in 1876.

Storey, Moorfield, an American lawyer and author; born in Roxbury, Mass., March 19, 1845. He was educated at Harvard, was private secretary to Charles Sumner in 1867-69, in 1869 was admitted to the bar and began practice in Boston. From 1873 to 1879 he was an editor of the "American Law Review," and in 1896 was president of the American Bar Association. In politics he was a prominent Independent. His published writings include a "Life of Charles Sumner" (1900) in the "American Statesmen" series.

Stork, in ornithology, any individual of the genus *Ciconia*, or of the sub-family *Ciconiinæ*. In form the storks resemble the herons, but are more robust, and have larger bills, shorter toes, with a non-serrated claw on the middle toe. They inhabit the

vicinity of marshes and rivers, where they find an abundant supply of food, consisting of frogs, lizards, fishes, and even young birds. Storks are migratory, arriving from the S. at their breeding haunts in the early spring, and departing again in the autumn. The white or house stork, *C. alba*, which is common in many countries of Central Europe, constructs a large nest, most frequently on the chimney of a cottage. The plumage is dirty white, the quills and the longest feathers on the wing covers black; beak and feet red. The male is about 42 inches long, the female somewhat less. The black stork, *C. nigra*, from the center and E. of Europe,

WHITE STORK.

Asia, and Africa, has the upper surface black, the lower parts white. Storks are protected by laws in some countries for their services in destroying small mammals and reptiles, and in consuming offal. They have also been celebrated from ancient times for their affection for their young; their reputation for regard for the old birds is much overrated, though heralds have adopted the stork as an emblem of piety and gratitude.

Storm, a violent commotion or disturbance of the atmosphere, producing or attended by wind, rain, snow, hail, or thunder and lightning; a tempest; often applied to a heavy fall of rain, snow, etc., without a high wind. There is, perhaps, no question in science in which there was long so large an admixture of speculation with fact as in the attempts made to reduce the phenomena of storms under general laws; the reason being that meteorological observatories were too few in number and too wide apart to represent the barometer pressure, the general course of the winds, and the rainfall, without drawing largely on conjecture.

Form and Extent of Storm Areas.— The circular isobaric lines on the charts represent very fairly the form storms usually assume in Europe, where the area of almost every storm is either circular or elliptical, the major axis of the ellipse being generally less than twice the minor axis. Rarely in Europe, but in America less rarely, is the form of storms much more elongated. The outline is occasionally very irregular, but in such cases the storm will be found to have parted into two or more distinct storms, or it comprises within the low-pressure area several satellite storms. The approximate circular form of storms is their general characteristic. This is a most important feature, whether as determining the practical rules for the guidance of sailors in storms, or for the forecasting of storms at particular seaports, in respect of the direction from which they may be expected to come, and the veerings of the winds during their continuance. The extent over which storms spread is very variable, being seldom less than 600 miles in diameter, but often two or three times greater, and more rarely even five times that amount. More than the whole of Europe is sometimes overspread by a single storm at one time. The prime difference between storms or cyclones and tornados is that the breadth of the space traversed by the latter is, as compared with that of storms, always quite insignificant. The area of storms is not constant from day to day, but varies in size, sometimes expanding and sometimes contracting; and it is worthy of remark that when a storm contracts in area the central depression gives signs of filling up, and the storm of dying out. On the other hand, when it increases in extent the central depression becomes deeper, the storm increases in violence, and occasionally is broken up into two or even more depressions, which become separate storms, with the wind circling round each. This occurs frequently with summer thunderstorms.

Direction in Which Storms Advance.— The direction in which their progressive motion takes place differs in different parts of the world — being perhaps determined by the prevailing winds. Thus, about half the storms of Middle and Northern Europe travel from the S. W. toward the N. E., and about 19 out of every 20 travel toward some point in the quadrant lying between the N. E. and the S. E. Storms rarely travel toward a W. point; in some of the instances which have been noted the W. course has been arrested at Norway, Denmark, the North Sea, or the British Islands, but such W. course is temporary, the E. course being afterward resumed. Some of the most violent E. storms fall under this head.

Storm

Storms do not always proceed in the same uniform direction from day to day, and, though the change which occurs in the direction of their progressive motion is generally small, yet occasionally it is very great. Thus, of the many interesting features peculiar to the storm which passed over Europe in the beginning of December, 1863, none were more remarkable than the sudden changes of its progressive motion. It was first observed on the W. of Ireland, from which it advanced E. to Liverpool, then turned S. through Worcester and Oxford to Cherbourg in France; it thence retreated N. through Oxford to Shields, from which it proceeded E. to Copenhagen. By the time it arrived at Copenhagen, its extent was only a fourth of what it had been the previous day, and the central depression half an inch less. Twelve hours later the atmospheric equilibrium was restored, the storm having died out on reaching the Baltic Sea.

The storms of the Mediterranean follow a different course. While a number take the general E. course of European storms, a larger number originate in the gulfs of Lyons and Genoa, and pursue devious courses over this N. extension of the Mediterranean, till they die out; several advance from Turkey and Greece toward the Alps; and others, comparatively few, advance in an E. course toward the Levant. A marked feature of these Mediterranean storms, including those of the Adriatic, is their slow, frequently retrograde, and erratic courses, and the small space traversed by them; and while they last the mistral, with dry cutting wind, sweeps down from the Alps on the health resorts of Southern France. By far the greater number of the storms of North America take their rise in the vast plain which lies to the E. of the Rocky Mountains, and thence advance in an E. direction over the United States, their course being largely determined by the Great Lakes; some of them cross the Atlantic, and burst on the W. shores of Europe. But the connection of the American with the European storms is not even yet well established. The storms of the West Indies generally take their rise somewhere N. of the region of calms, and, tracing out a parabolic course, proceed first toward the W. N. W., and then turn to the N. E. about lat. 30° N., not a few traversing the E. coasts of North America as far as Nova Scotia. South of the equator they follow an opposite course. Thus, in the Indian Ocean they first proceed toward the S. W., and then gradually curve round to the S. E. The hurricanes of India usually pursue a parabolic path, first traversing the E. coast toward Calcutta, and then turning to the N. W. up the valley of the Ganges. The typhoons of the Chinese Seas resemble, in the course they take, the hurricanes of the West Indies.

Probably the course tracked out by storms is determined by the general system of winds which prevail, modified by the unequal distribution of land and water on the surface of the globe, the diffusion of the aqueous vapor, and its concentration over the regions traversed by the storms. Facts seem at present to point to the general conclusion that storms follow the course of the atmospheric current in which the condensation of the vapor into the rain which accompanies them takes place.

Rate at Which Storms Travel.— The average rate of the progressive movement of European storms is about 16½ miles per hour. From an examination of extensive series of storms Professor Loomis has shown that the average rates of progress of storm centers are in miles per hour 28 for the United States, 18 for the middle latitudes of the Atlantic Ocean, 17 for Europe, 15 for the West Indies, and 9 for the Bay of Bengal and China Sea. On Jan. 7–8, 1877, a storm traveled in 24 hours from Indianola, Tex., to Eastport, Me.,— 1,872 miles, or 78 miles an hour. On the other hand, the rate of progress is, particularly in the tropics, sometimes so slow as to be virtually stationary; and, as already stated, they occasionally recurve on their paths.

Relations of Temperature, Rain, and Cloud to Storms.—Temperature increases at places toward which and over which the front part of the storm is advancing, and falls at those places over which the front part of the storm has already passed. In other words, the temperature rises as the barometer falls, and falls as the barometer rises. When the barometer has been falling for some time clouds begin to overspread the sky, and rain to fall at intervals; as the central depression approaches the rain becomes more general, heavy, and continuous. After the center of the storm approaches, or shortly before the barometer begins to rise, the rain becomes less heavy, falling more in showers than continuously; the clouds break up when the center has passed, and fine weather, ushered in with cold breezes, ultimately prevails. If the temperature begins to rise soon and markedly after the storm has passed, a second storm may be shortly expected.

Direction of the Wind.— If the winds are examined, they will be observed whirling round the area of low barometer in a circular manner, and in a direction contrary to the motion of the hands of a watch, with a constant tendency to turn inward toward the center of lowest pressure, in the manner formulated in Buys-Ballot's law. The wind in storms neither blows round the center of lowest pressure in circles, nor does it blow directly toward that center, but

takes a direction nearly intermediate, approaching, however, nearer to the direction and course of the circular curves than of the radii to the center. In the front of the storm the winds blow more toward the center, but in the rear they blow more closely approximate to the circular isobaric lines. Where the direction of the wind differs to any material degree from the above it is light, and consequently more under local influences, which turn it from its true course. Thus, the center of the storm being near Liverpool, the direction of the wind is S. W. at Paris, S. at Yarmouth, N. E. at Silloth, N. at Dublin, and N. W. at Cork — instead of S. at Paris, S. E. at Yarmouth, N. at Silloth, N. W. at Dublin, and W. at Cork, if it had blown directly to the area of lowest pressure, and W. at Paris, S. W. at Yarmouth, E. at Silloth, N. E. at Dublin, and N. at Cork, if it had circulated in the direction of the isobaric curves. Hence in this storm the winds circulate round the center of least pressure, or, to speak more accurately, the whole atmospheric system flows in on the center in a vorticose manner. This peculiarity is common to all storms in the Northern Hemisphere that have yet been examined. In the Southern Hemisphere a rotatory motion is also observed round the center of storms, but it takes place in a contrary direction, or in the direction of the motion of the hands of a watch, instead of contrary to that direction, as prevails N. of the equator.

Professor Taylor first applied Dove's law of rotation to explain the direction of the rotation of storms round their center. On the morning of Nov. 2, 1863, the pressure over England being much less than in surrounding countries, if the earth had been at rest air currents would have flowed from all directions to England, to fill up the deficiency, in straight lines. The earth, however, is not at rest, but revolves from W. to E.; and, as the velocity of rotation diminishes as the latitude increases, it is evident that the current, which set out say from Lyons to the N., would, on account of its greater initial velocity, when it arrived at Paris, blow no longer directly to the N., but to a point a little to the E. of N.; in other words it would no longer be a S. but a S. W. wind. Again, since the current from the N. of Scotland had a less velocity than those parts of the earth's surface on which it advanced, it lagged behind, and consequently by the time it arrived at Silloth in the N. of England had changed from a N. to a N. E. wind. Similarly the N. W. current changed to a N., the S. W. to a W., etc. The W. and E. currents, since they continued in the same latitude, would have blown in the same direction if they had not been disturbed by contiguous currents. Hence in a storm the whole system of winds appears to rotate round the center. As a further confirmation of this theory, it is observed that when a high pressure covers a limited space the wind is always observed gently whirling out of this area of high barometer, but in exactly opposite directions in both hemispheres from those assumed when it blows round and in on an area of low pressure. It follows in the Northern Hemisphere that as storms advance the general veering of the wind at places lying N. of the path of their center is from N. E. by N. to W., and at places S. of their center from N. E. by E. and S. to N. W., and conversely in the Southern Hemisphere.

Force of the Wind.—The rule is simple, and without exception — viz., the wind blows from a high to a low barometer with a force proportioned to the barometric gradient or to the difference of the barometric pressures reduced to sea-level. Hence where the isobaric lines crowd together the violence of the storm is most felt, and where they are far asunder the winds are moderate, light, or nil. We thus see the importance of observations from a distance in forecasting the weather. To take an illustration: the importance of observations from Norway and Sweden to all seaports on the E. coast of Great Britain cannot be overestimated, for if the pressure be high in Norway and low in the North Sea or in the S. of Great Britain violent E. gales will sweep down on Scotland, and, unless foreseen and provided against, strew the coast with wrecks; whereas if the pressure be nearly equal little danger need be apprehended, even though the barometer be low in Great Britain. As the wind nears the center of the storm it gradually abates, till on reaching the center a lull or calm takes place — a peculiarity more uniformly noted as regards tropical storms. Calms and light winds also prevail along the ridge of highest barometer, or the region where the pressure is greatest, and on receding from which the pressure diminishes on each side. This arrangement of the pressure is accompanied with fine weather and the "pet" days of winter. It may not inaptly be compared to the watershed in physical geography, since from it the wind flows away on either hand toward the places where pressure is less.

The progressive motion of storms, which may vary from zero to 78 miles an hour, measures the time taken in passing from one place to another, but it gives no indication of the violence of the storm. This is determined by the velocity of the wind round and inward on the center of the storm, which in Europe and the United States frequently amounts to 60 or 80 miles an hour continuously for some time. In intermittent gusts a speed of 120 miles an

Storm

hour has been several times observed in Great Britain—a velocity which is perhaps sometimes surpassed by storms within the tropics. On the top of Ben Nevis higher velocities, rising to upward of 150 miles, are of not infrequent occurrence.

Causes of Cyclones.—Dove, who did so much in this department of meteorology, held the view that cyclones are formed when two great atmospheric currents, called polar and equatorial, flow side by side, storms being the eddies, as it were, formed along the line of junction. It is to be kept in mind that the qualities of the atmosphere in the front portion of a cyclone are quite different from those in the rear — the former being warm and moist, while the latter are cold and dry. The conclusion is inevitable that the apparent rotation of winds in storms is simply a circulatory movement maintained between two currents, and that no mass of the same air makes the complete circuit of the cyclone. This feature of storms will, if rightly apprehended, play an important rôle in the development of the theory of the law of storms which lies yet in the future. The height to which storms extend in the atmosphere, as has been shown from the Ben Nevis observations, is greatly less than had been supposed.

Forecasting.—Valuable aid in forecasting storms and weather is derived from two important deductions from past observations: (1) A cyclone tends toward a path near to the anticyclone which lies immediately to the right of the progressive motion of the storm at the time. (2) When the rates of fall of the barometer at stations in the W. of Europe are noted, it is found that the path taken by the coming storm is indicated by those stations at which the rates of fall of the barometer are greatest. See METEOROLOGY.

Relations of Storms to the Character of the Season.—This is vital and all-important. Thus, as regards the British Islands, when the general path pursued by storms in their E. course over Europe lies to the S. the winter is severe, inasmuch as the British Islands are then on the N. side of the center of low pressure, and consequently in the stream of the N. and E. winds which there prevail. On the other hand, when the paths of storms lies to the N. the British Islands are on the S. side of the low pressure, and therefore in the stream of the warm, moist, S. and S. W. winds which there prevail. The weather of December, 1890, and that of February, 1891, illustrate these two distinct types of weather. In December, 1890 the weather was colder in the S. counties of England than it had been during that century. At Oxford the temperature was 10.4° under the average, and in the S. W. provinces of Russia the mean temperature was fully 14.0° below the average. On the other hand, to the N. of a line drawn from Wilna to Bergen the temperature was above the average, the excess above the mean increasing on advancing N. till in the N. of Norway it was 10.0°, and at the entrance of the White Sea 13.0°. In the same month in the Eastern United States and Canada temperature was under the average, the deficiency being 11.5° at Montreal; whereas over the rest of the United States temperature was high, the excess increasing on proceeding N. till, in Assiniboia, it was from 14.0° to 17.0° above the average. The explanation is at once afforded by the distribution of atmospheric pressure at the time. In Europe pressure was unusually high from the N. of Scotland to St. Petersburg. But, what is of more importance, it diminished steadily S. over the continent and into the N. of Africa, and, on the other hand, also diminished steadily over the N. of Europe, being 0.350 inch lower at the North Cape than at Bergen. Consequently the whole of the S. half of Europe was swept by N. and E. winds, bitterly cold and dry, and temperature fell unprecedentedly low; but in the N. S. and S. W. winds inevitably prevailed, bearing to the N. climes the warmth of lower latitudes. In America atmospheric pressure was above the average over a broad area extending from New Orleans to Lake Huron, while on the one hand over the Eastern States and Canada it fell below the average, and on the other also below the average over Assiniboia. From this distribution of pressure it inevitably resulted that Canada and the Eastern States were swept by cold, dry, N. W. winds of unusual strength and prevalence, while Assiniboia enjoyed S. breezes from, as the isobarics and winds show, the low latitudes of the Gulf of Mexico.

It is plain that the character of the weather of any particular day or season is wholly determined by the way in which areas of high and of low atmospheric pressure are distributed over the region during that day or season. Further, the weather of the coming season could certainly be predicted for say the British Islands, if only the general path was known which the centers of the Atlantic cyclones will take in their E. course over Europe; for if the paths of the winter storms be to the N. of Great Britain the winter will be an open one, but if to the S. a severe winter is the certain result. Toward the solution of this highly practical problem we look to seamen to put us in possession of a fuller and, above all, an earlier knowledge of the fluctuations of the surface temperature of the Atlantic, and to high-level observatories for the data required in obtaining a clearer insight into the history and theory of storms. See METEOROLOGY; WEATHER BUREAU; WIND SIGNALS.

Storm, Theodor (Woldsen) (stōrm), a German author; born in Husum, Germany, Sept. 14, 1817. He first attracted attention in literature with "The Song-Book of Three Friends" (1843), the work of Tycho and Theodor Mommsen and himself; "Immensee" (43d ed. 1896), a short tale, and a volume of "Poems" (11th ed. 1897). Among his other works are: "Aquis Submersus" (1877); "The Senator's Sons" (1881); "Knight of the White Horse" (1888); etc. He died in Hadamarschen, Germany, July 4, 1888.

Storm Glass, a tube containing a liquid holding a solution which is sensible to atmospheric changes. In clear weather the substance is seen to settle near the bottom of the tube, the liquid remaining comparatively clear; previous to a storm the substance rises, causing the liquid to present a turbid and flocculent appearance.

Storm Signal, a signal for indicating to mariners, fishermen, etc., the probable approach of a storm. See SIGNAL SERVICE BUREAU.

Stormy Cape, or **Cape of Storms,** a name given by the Portuguese navigator Dias to the Cape of Good Hope.

Stormy Petrel, in ornithology, the *Procellaria pelagica,* common in the North Atlantic. In general appearance it is not unlike a swift, of a sooty black color, with a little white on the wings, and some near the tail. It is popularly believed to be a harbinger of bad weather, and is called by sailors Mother Carey's Chicken, a name which is also applied to other species.

Stornoway, the chief town and seaport of Lewis, the largest of the Outer Hebrides, in the N. E. of the island, at the head of the deep inlet of Loch Stornoway, which is sheltered to the N. by a long, irregular peninsula. It has several good public buildings, and on an eminence overlooking the town stands Stornoway Castle, a castellated Tudor edifice, long the residence of Sir James Matheson, who made great improvements in the vicinity. A Free Church (for services in English) was opened in 1878. Stornoway is an important fishing station, and it has several saw, carding, and corn mills, a large distillery, etc., and is the seat of an important cattle fair held on the second Wednesday in July. Two steamers ply regularly between Stornoway and Glasgow, and there is a bi-weekly mail packet via Poolewe to Dingwall.

Storrs, Emory Alexander, an American lawyer; born in Hinsdale, N. Y., August 12, 1835. He read law with his father and Marshall R. Chaplin; was admitted to the bar in Buffalo in 1855, and practised there for a short time; removed to Chicago in 1859. He became prominent as a criminal lawyer, and for several years figured as counsel in almost every important criminal case in the Chicago courts. He became well known as a presidential campaign orator, and was a delegate-at-large to the National Republican Conventions of 1868, 1872, and 1880, where he was influential in shaping the platform of the party. He died in Ottawa, Ill., Sept. 12, 1885.

Storrs, Richard Salter, an American clergyman; born in Braintree, Mass., Aug. 21, 1821; was graduated at Amherst College in 1839 and at the Andover Theological Seminary in 1845. His first pastorate was in Harvard Congregational Church, Brookline, Mass., where he was ordained Oct. 22, 1845. In 1846 he was called to the Church of the Pilgrims in Brooklyn, N. Y., where he was pastor emeritus at the time of his death. He was one of the founders of the "Independent" in 1848 and remained on its editoral staff till 1861; served on the Brooklyn Park Commission in 1871–1873; was president of the Long Island Historical Society, and of the American Board of Commissioners for Foreign Missions; and the author of numerous books, sermons, orations, discourses, etc. He died in Brooklyn, N. Y., June 5, 1900.

Storthing (stor'ting), the parliament or supreme legislative assembly of Norway; the great court or representative of the sovereign people. It is elected triennially, and holds annual sessions. When in session it divides itself into two houses, one-fourth of the members constituting the lagthing, and the remaining three-fourths the odelsthing.

Story, Joseph, an American jurist; born in Marblehead, Mass., Sept. 18, 1779. In 1811 he was appointed an associate justice of the United States Supreme Court, and held the office till his death. His works include: "Commentaries on the Constitution of the United States" (1833); "Commentaries on the Conflict of Laws," considered his ablest effort (1834); and "Miscellaneous Writings" (1835). In 1851 his "Life and Letters" was edited by his son, W. W. Story. He died in Cambridge, Mass., Sept. 10, 1845.

Story, William Edward, an American educator; born in Boston, Mass., April 29, 1850; was graduated at Harvard College in 1871; studied physics and mathematics in Europe in 1871–1875; was assistant professor and Professor of Mathematics at Johns Hopkins University in 1876–1889; and in the latter year he accepted the chair of mathematics at Clark University. He became identified with several mathematical and other learned societies. His publications include contributions to technical periodicals.

Story, William Wetmore, an American sculptor, son of Judge Joseph; born in Sa-

lem, Mass., Feb. 19, 1819; was graduated at Harvard in 1838; was admitted to the bar and practised five years; went to Rome to study art and made Italy his home. Among his sculptures are: a statue of Edward Everett (in the Boston Public Garden); and one of Prescott at Bunker Hill; "Cleopatra"; "Semiramis"; "Judith"; "Jerusalem"; "Medea"; "The Sibyl"; etc.; and busts of Judge Story, Lowell, Bryant, etc. He published: "Report of Cases Argued and Determined in the Circuit

WILLIAM W. STORY.

Court of the United States for the First Circuit" (1842–1847); "Address Delivered before the Harvard Medical Association" (1842); "Nature and Art: A Poem" (1844); "Treatise on the Law of Contracts not under Seal" (1844); "Treatise on the Law of Sales of Personal Property" (1847); "Poems" (1847); "Life and Letters of Joseph Story" (1851); "Poems" (1856); "The American Question" (1862); "Roba di Roma" (1862); "Proportions of the Human Figure" (1866); "Graffiti d'Italia" (1868); "A Roman Lawyer in Jerusalem" (1870); "Nero: An Historical Play" (1875); "Stephania: A Tragedy" (1875); "Castle St. Angelo and the Evil Eye" (1877); "Ode on the Anniversary of the Fifth Half-Century of the Landing of John Endicott at Salem, Mass." (1878); "Vallombrosa" (1881); "He and She" (1883); "Poems" (1885–1886); "Fiammetta" (1886); "Conversations in a Studio" (1890); "Excursions in Art and Letters" (1891); "A Poet's Portfolio" (1894). He died in Vallombrosa, near Florence, Italy, Oct. 7, 1895.

Stothard, Thomas, an English painter; born in London Aug. 17, 1755. His first notable effort was a series of illustrations for the "Town and Country Magazine," which was followed by others for Bell's "British Poets" and the "Novelist's Magazine." The popularity of these was so great that for many years his services were constantly in request by the leading publishers in London. His earliest pictures exhibited at the Royal Academy were "The Holy Family" and "Ajax defending the Body of Patroclus." In 1791 he was chosen an associate, in 1794 a member, and in 1813 librarian of the Academy. Not less than 3,000 of his illustrations have been engraved, including those to Boydell's "Shakespeare," "The Pilgrim's Progress," "Robinson Crusoe," and Rogers' "Italy" and "Poems." Perhaps his best known painting is his "Canterbury Pilgrims," engraved in 1817. He died in London, April 27, 1834. His son, CHARLES ALFRED STOTHARD (1786–1821), acquired a great reputation as an antiquarian draftsman.

Stoughton, John, an English clergyman; born in Norwich Nov. 18, 1807; was educated at Highbury College, Islington, and University College, London. Appointed Congregationalist minister at Windsor in 1832, he removed to Kensington in 1843, and there labored till his retirement in 1875, when the congregation presented him with $15,000. From 1872 till 1884 he was Professor of Historical Theology and Homiletics in New College, St. John's Wood. He was Congregational lecturer in 1855, chairman of the Congregational Union in 1856, took part in the Evangelical Alliance Conferences at New York (1873) and Basel (1879), and lectured on missions in Westminster Abbey in 1877. He died in 1897.

Stour, a river of England 47 miles long, flowing E. along the Suffolk and Essex boundary to the North Sea at Harwich.

Stourbridge (stur'brij), a market town of Worcestershire, England, on the Stour, at the border of Staffordshire and the Black Country; 4½ miles S. by W. of Dudley and 12 W. by S. of Birmingham. The famous fireclay named for this town is said to have been discovered about 1555 by wandering glassmakers from Lorraine. Stourbridge has glass, earthenware, and firebrick works, besides manufactories of iron nails, chains, leather, etc. It has a grammar school (at which Samuel Johnson passed a year), a corn exchange, county court, and mechanics' institute.

Stoup, Stoop, or **Stope,** a deep and narrow vessel for holding liquids; a flagon; also a vessel used as a measure; as, a pint stoup; also, a portable vessel for holy water; a stone basin for holy water, placed at the entrance to a Roman Catholic church; an aspersorium.

Stove, in former times, a room or place artificially heated, such as a bath, a hothouse, etc.

"When a certain Frenchman came to visit Melanchthon, he found him in his stove, with one hand dandling his child in the swaddling clouts, and the other holding a book and reading it."—Fuller,

In modern usage, an apparatus in which a fire is made for the purpose of warming a room or house, or for cooking, or for other purposes. They are generally made of iron, sometimes of brick or tiles, or slabs of stone, and are of various forms, according to the heating medium used. On the continent of Europe stoves are generally of earthenware, being made round or square, and are frequently constructed mainly of tiles. Also, a small box with an iron pan used for holding coals to warm the feet; a foot-warmer.

Stowaway, one who conceals himself on board a vessel about to leave port, and who does not mean to show himself till too far from the shore to be sent back, and so obtains a free passage.

Stow, Baron, an American clergyman; born in Croydon, N. H., June 16, 1801; was graduated at Columbia College in 1825; was ordained in the Baptist Church; became pastor in Portsmouth, N. H., and held charges in Boston, Mass., the first in 1832–1848 and the second in 1848–1867. He was one of the most eloquent and prominent preachers in the Baptist Church. His work as a member of the Executive Committee of the American Missionary Union greatly strengthened that movement. His publications include "Memoirs of Harriet Dow" (1832); "History of the Baptist Mission to India" (1835); "History of the Danish Mission on the Coast of Coromandel" (1837); "Daily Manna" (1842); "The Whole Family in Heaven and Earth" (1845); "Christian Brotherhood" (1859); and "First Things" (1859). He died in Boston, Mass., Dec. 27, 1869.

Stow, John, an English historian; born in London about 1525. He learned his father's business, tailoring, but his bent was toward antiquarian research. His chief publications were "A Summary of Englische Chronicles" (1561); "Annales, or a Generale Chronicle of England from Brute until the present Yeare of Christe" (1580); and "A Survey of London" (1598). He also printed the "Flores Historiarum of Matthew of Westminster" (1567), the "Chronicle of Matthew of Paris" (1571), and the "Historia Brevis of Thomas Walsingham" (1574). He died in London April 6, 1604.

Stowe, Calvin Ellis, an American educator; born in Natick, Mass., April 6, 1802; was graduated at Bowdoin College in 1824, at Andover Seminary in 1828; and edited the Boston "Recorder" in 1829–1830. He was Professor of Greek at Dartmouth College in 1830–1832, and of Sacred Literature in Lane Theological Seminary, Cincinnati, O., in 1833–1835. He married Harriet Elizabeth Beecher in January, 1836, and went to Europe to examine the public school systems. He was professor at Bowdoin in 1850; and at Andover in 1852–1864: His publications include a translation of Jahn's "Hebrew Commonwealth" (1829); "Lectures on the Poetry of the Hebrews" (1829); "Report on Elementary Education in Europe"; "Introduction to the Criticism and Interpretation of the Bible" (1835); and "Origin and History of the Books of the Bible" (1867); also addresses and pamphlets. He died in Hartford, Conn., Aug. 22, 1886.

Stowe, Harriet Elizabeth Beecher, an American novelist, daughter of Lyman Beecher and sister of Henry Ward Beecher; born in Litchfield, Conn., June 14, 1811. was educated at Litchfield Academy and at the school of her sister Catherine in Hartford; at the age of 14 she began teaching; in 1832 removed to Cincinnati, O. In 1836 she was married to Prof. Calvin Ellis Stowe; in 1850 she removed to Brunswick, Me., and later to Andover, Mass.; in 1864 she settled in Hartford, Conn., where she spent the remainder of her life. She published: "The Mayflower; or Sketches of Scenes and Characters among the Descendants of the Pilgrims" (1843); "Uncle Tom's Cabin; or, Life among the Lowly" (1852); "The Two Altars" (1852); "Key to Uncle Tom's Cabin" (1853); "Uncle Tom's Emancipation" (1853); "Sunny Memories of Foreign Lands" (1854); "The Mayflower, and Miscellaneous Writings" (1855); "The Colored Patriots of the American Revolution" (1855); "First Geography for Children" (1855); "Dred: A Tale of the Great Dismal Swamp" (1856); "Earthly Care a Heavenly Discipline" (1856), formerly published with "Uncle Tom's Emancipation"; "Our Charley and What to Do with Him" (1858); "The Minister's Wooing" (1859); "The Pearl of Orr's Island" (1862); "Agnes of Sorrento" (1862); "Reply to the Address of Thousands of Women of Great Britain and Ireland to their Sisters of the United States" (1863); "The Ravages of a Carpet" (1864); "House and Home Papers" (1864); "Stories about our Boys" (1865); "Little Foxes" (1866); "Religious Poems" (1867); "Queer Little People" (1867); "Daisy's First Winter, and Other Stories" (1867); "The Chimney Corner" (1868); "Men of our Times" (1868); "Oldtown Folks" (1869); "The American Woman's Home" (1869), with Catherine E. Beecher; "Lady Byron Vindicated" (1870); "Little Pussy Willow" (1870); "Pink and White Tyranny" (1871); "Sam Lawson's Fireside Stories" (1871); "My Wife and I" (1871); "Six of One, by Half a Dozen of the Other" (1872); "Lives and Deeds of our Self-Made Men" (1872); "Palmetto Leaves" (1873); "Woman in Sacred History" (1873); "Betty's Bright Idea, and Other

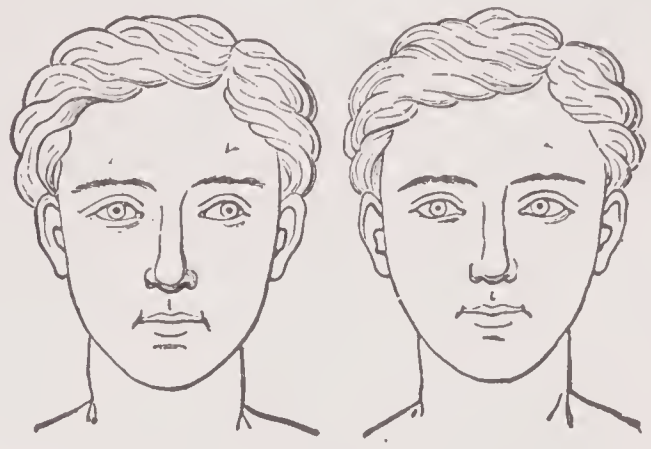
Tales" (1875); "We and our Neighbors" (1875); "Deacon Pitkin's Farm, and Christ's Christmas Presents" (1875); "Footsteps of the Master" (1876); "Captain Kidd's Money, and Other Stories" (1876); "The Ghost in the Mill, and Other Stories" (1876); "Poganuc People" (1878); "A Dog's Mission" (1881); etc. Her best known work, "Uncle Tom's Cabin" (suggested by the life of Josiah Henson) has been translated into many languages, its sale exceeding that of any previous work of English fiction. She died in Hartford, Conn., July 1, 1896.

Stowell, Charles Henry, an American author; born in Perry, N. Y., Oct. 27, 1850; was graduated at the Medical Department of the University of Michigan in 1872; held the chair of physiology at the University of Michigan in 1876–1885; followed his profession in Washington, D. C., in 1885–1897; afterward applied himself to technical literature. His publications include "Primer of Health"; "Laboratory Manual for Teaching Physiology"; "Students Manual of Histology"; "Microscopical Diagnosis"; "Structure of Teeth"; etc. He also became editor of several monthly journals, including "Practical Medicine"; "Food"; "The Microscope"; "Trained Motherhood"; and the "National Medical Review."

Stowell, William Scott, Lord, an English jurist, eldest brother of Lord Eldon; born in Heworth, Durham, England, Oct. 17, 1745. He was educated at Newcastle, went to Oxford in 1761, and became a college tutor. In 1779 he took the degree of D. C. L., removed to London, and was called to the bar in 1780. Dr. Johnson introduced him to the Literary Club. As a barrister at Doctors' Commons he obtained a large practice, and his promotion was rapid. In 1788 he was appointed judge in the Consistory Court, knighted, and nominated a privy councillor. In 1798 he became judge of the Court of Admiralty. Both as an ecclesiastical and admiralty judge he won high distinction. He wrote no systematic treatise or text-book, but his judgments were admirably reported; and he was long the highest English authority on the law of nations. He represented Oxford in the House of Commons for 20 years; but took no part in the business of Parliament. At the coronation of George IV. he was raised to the peerage under the title of Baron Stowell of Stowell Park. In 1828 he retired from the bench. He died Jan. 28, 1836.

Strabismus, squinting arising from the optic axes of the eyes in certain individuals not being as in normal cases, parallel. Strabismus may affect one or both eyes, and may be upward, downward, inward, outward, or in the intermediate directions.

Strabo, a noted geographer; born in Amasea, Pontus, about 63 B. C. Of his personal history the little that is known is gleaned from passages in his own work. On the mother's side he was descended from a Greek family closely connected with the kings of Pontus. Of his father we know nothing. The dates of his visits to most of the countries through which he traveled are very doubtful. In 29 B. C. he was at Gyaros on his way to Corinth. In 24 B. C. he was with his friend Ælius Gallus in Egypt. When he first visited Rome he must have been of mature years.



STRABISMUS: POSITION OF THE EYES.

The name Strabo, "squint-eyed," is originally Greek, and its origin is obvious, but whether any of his ancestors bore it is uncertain. His preceptors were Tyrannio of Amisus, Aristodemus of Nysa, and Xenarchus of Seleucia. His acquaintance with history, mythology, and the poets of Greece attests at once the thoroughness of his education and his general culture. Professional life had evidently no charm for him. He seems to have been possessed of ample means which he expended on travel, the results of which, after a lifetime's toil, he has bequeathed to us in his "Geography." But he also devoted himself to philosophy, and is cited by Plutarch (Lucullus 28, Sulla 26) as Strabo, the philosopher. His work entitled "Historica Hypomnémata" in 43 books is supposed to have contained a narrative of the events from the close of the "History" of Polybius to the battle of Actium.

The facts recorded in the "Geography" of Strabo are in great measure the result of his own observation. Yet there exists a vast difference in his treatment of different countries. In the case of some he is almost microscopic in fullness of detail. Of others he is content with a hasty and cursory description. The range of his travels is a wide one, embracing the territories from Armenia to Tyrrhenia W., and from the Euxine to Ethiopia S. In his work he is largely indebted to the geographers who preceded him — Eratosthenes, Artemidorus, Polybius, Posidonius, Aristotle, Theopompus, Thucydides, Aristobulus, and others.

Of Greece he seems to have seen less than of almost any country. He appears, however, to have obtained in Rome much information regarding the Transalpine regions. Strangely, he disparages the discoveries of Herodotus, and undervalues the works of Roman writers, quoting almost none save Fabius Pictor, Asinius Pollio, and Julius Cæsar.

The principal value of his works lies in his method. The number of historical facts recorded by him is enormous. The date of his death is unknown, but it must be placed between A. D. 21 and 25. As a writer, Strabo is always clear, simple, and unaffected. His "Geography" comprises 17 books; 2 introductory, 8 devoted to Europe, 6 to Asia, and 1 to Africa. The *editio princeps* is the "Aldine" (1516). That by Falconer (1807, 2 vols. fol.) is a reprint of Almeloveen's reprint of Casaubon's edition, with no improvement in the text, but containing a collation of the Eton, the Escurial, and the two Medicean MSS. The edition of Adamantios Koray (1815–1818, 4 vols. 8 vo.) is the first notable critical text. That by Gustavus Kramer (1844 *et seq.*) is the first really valuable one. In 1875 a MS. of the "Geography" was discovered in the abbey of Grotta Ferrata near Frascati, older than any of the 28 previously known MSS., and supplying many lucunæ. The best translations are those in German by C. J. Groskurd (3 vols. 8 vo. 1831–1834). A fair English version with copious notes and a complete index was published in Bohn's "Classical Library" (1854, 3 vols. post. 8vo.). An excellent edition of the text is that of Aug. Meineke (1852–1853, 3 vols. 8vo., 2d ed. 1866).

Strabo, Walafrid, a mediæval poet; born in Suabia about 809. He wrote a running exegetical commentary on the Scripture, "The Orderly Gloss" ("Glossa Ordinaria"), which was long a work of high authority in the schools; a history of the development and growth of ecclesiastical institutions and ordinances — "Of the Beginnings and Growths of Things Ecclesiastical"; "Life of St. Gall"; "Life of St. Othmar"; the poem "Vision of Saint Wettin," in which is an episode of the poet's journey to hell, purgatory, and heaven; and a poem, "The Little Garden," treating of the plants in the garden of the poet's monastery. He died while crossing the Loire river in France Aug. 18, 849.

Strabometer, in medical practice, an instrument used to measure the degree of deviation as well as the precise result obtained by tenotomy. The strabometer of Dr. Laurence had to be moved from one eye to the other in order to compare the degree of deviation. A binocular strabometer, invented in 1870 by Dr. Galezowski, does not present the same inconvenience; the two needles which slide in the channel of a screw, are easily placed opposite to the center of each cornea; and by the divisions which are marked on the horizontal bar, the deviation is immediately noted.

Strachey, William, an English historian. He sailed with Sir Thomas Gates in 1609, on the vessel "Sea Venture"; was shipwrecked on the Bermudas, but escaped to Virginia (1610) on a boat that had been constructed from the wreck, and was secretary of the colony for three years. He wrote: "A True Repertory of the Wracke and Redemption of Sir Thomas Gates, upon and from the Islands of the Bermudas," published in Purchas's "Pilgrims" (vol. iv.); "Historie of Travaile into Virginia Britannia," a quaint and valuable work of historical reference (about 1618), and first published by the Hakluyt Society from original MS. (No. 6, 1849). The time and place of his death are unknown.

Stradivari, Antonio (Stradivarius), an Italian violin maker; born in Cremona, Italy, about 1649. He was a pupil of Nicolo Amati, in whose employment he remained till 1700, when he began making on his own account. It was he who settled the typical pattern of the Cremona violin, and his instruments, for tone and finish, have never yet been excelled. He died in Cremona Dec. 17, 1737.

Strafford, Thomas Wentworth, Earl of, an English statesman, the eldest son of Sir William Wentworth; born in London April 13, 1593; educated at Cambridge. After leaving the university he received the honor of knighthood. He sat in Parliament for Yorkshire for a number of years, and when Charles I. asserted that the Commons enjoyed no rights but by royal permission, he was strongly opposed by Sir Thomas Wentworth. In this struggle his abilities were recognized and high terms offered him by the court, which he accepted, and in 1628 was successively created Baron Wentworth, privy-councillor, and President of the North. Archbishop Laud selected him to proceed to Ireland as lord deputy in 1632. Here he greatly improved the state of the country, both as regarded law, revenue, and trade; but to accomplish his ends he did not scruple to use the strongest and most arbitrary measures. For these services he was created Earl of Strafford. When the Long Parliament met, the very first movement of the party opposed to arbitrary power was to impeach Strafford of high treason, with which charge Pym appeared at the bar of the House of Lords in 1640. His defense, however, was so strong that the original impeachment was deserted for a bill of attainder. The bill passed the Commons by a great majority, and was feebly supported by the House of Lords. The king endeavored to secure his safety,

but yielded to the advice of his counsellors, backed by a letter from Strafford himself, who urged him, for his own safety, to ratify the bill. Strafford was accordingly beheaded on Tower Hill May 12, 1641. The accompanying illustration is a copy of the noted painting by Paul Delaroche.

Strahan, Lisbeth Gooch Séguin, an English author. She wrote: "Children's Pastime: Pictures and Stories" (1874); "Walks in Algiers" (1878); "A Little Nineteenth Century Child, and Other Stories" (1878); "Life in a French Village" (1879); "The Black Forest: Its People and Legends" (1879); "The Country of the Passion Play" (1880); "Rural England" (1884); "A Round of Sunday Stories" (1886); "The Algerine Slave: A Novel" (1888).

Straight-out Democrats, a political party which arose in the United States in 1872, their distinguishing tenet being that governments should be limited to police functions. They have not risen into any considerable power.

Strain, in mechanics, the force which acts on the material, and which tends to disarrange its component parts or destroy their cohesion, or the charge resulting from application of such force. See STRESS: STRENGTH OF MATERIALS.

Strait City, a name applied to **Detroit,** Mich.; situated on the stream or strait that joins Lakes Erie and St. Clair. The word Detroit is French, and signifies "strait."

Strait of St. Clair. See DETROIT RIVER.

Straits Settlements, a British crown colony in the Malay Peninsula, deriving its name from the Straits of Malacca which separate the Malay Peninsula from Sumatra, and form the great trade route between India and China. Area about 1,542 square miles; pop. (1901) 572,249. The capital of the colony and seat of government is Singapore. The governor is assisted by executive and legislative councils, the first consisting of nine official members, and the second, of these with seven non-official members, two of whom are nominated by the Chambers of Commerce of Singapore and Penang. The constituent parts are as follows: SINGAPORE, an island off the S. extremity of the Malay Peninsula; area, 206 square miles; pop. (1901) 228,555. It is hilly and forested, fertile, and not unhealthy for Europeans. Chief local products, pepper and gambier. The city of Singapore is a great commercial center for the East. It has a commodious harbor, protected by fortifications. It is the headquarters of the British military and naval forces in these regions. The usual garrison consists of a battalion of infantry and

LORD STRAFFORD RECEIVING BLESSING OF ARCHBISHOP OF CANTERBURY ON HIS WAY TO EXECUTION.

two batteries of artillery. PENANG, or PRINCE OF WALES ISLAND, lies 360 miles N. of Singapore, and about 2 miles off the coast of Province Wellesley; area, 107 square miles; pop. (1901) 248,207. The port and capital is Georgetown, better known as Penang. PROVINCE WELLESLEY is politically one with Penang. It stretches 45 miles along the coast of the mainland; area, 288 square miles. THE DINDINGS, about 80 miles S. of Penang, consist of the island of Pangkor and a small strip of territory on the mainland; area, 265 square miles. Politically this settlement is a part of Penang. The pop. of Province Wellesley and The Dindings is included in that of Penang. MALACCA is a town and territory 240 miles S. of Penang. Its coast, rocky and barren, extends 42 miles; area, 659 square miles; pop. (1901) 95,487. It is ruled by a resident councillor, subject to the governor of the colony. Included in the administration of the Straits Settlements are the COCOS (or KEELING ISLANDS), a small coral group lying some 700 miles S. W. of Java (area 9 square miles; pop. 560), and CHRISTMAS ISLAND, which lies 200 miles S. W. of Java.

The Protected States.—On the mainland there are four protected Malay States. These countries are rich in natural resources, and for several years Perak and Selangor have exported the greater part of the Straits tin. The soil is fertile, and there are vast areas of forest land available for conversion into plantations; but mining at present makes agriculture a secondary consideration. PERAK, on the W. coast of the peninsula; area, 6,555 square miles; pop. (1901) 430,000; capital, Taiping. The ports are Taluk Anson and Port Weld. SELANGOR, area, 3,500 square miles; pop. (1901) 326,000; capital, Kwala Lumpur. NEGRI SEMBILAN, a federation of nine small states lying to the N. E. of Malacca; area, 3,000 square miles; pop. 121,000. Planting, especially of coffee, is progressing here. PAHANG contains much gold; area, 14,000 square miles; pop. (1901) 100,000. JOHORE is an independent Malay State at the S. extremity of the peninsula; area, 9,000 square miles; pop. about 200,000; capital, Johore Bharu. Perak, Selangor, Pahang, and Negri Sembilan agreed in July, 1896, to form one administrative federation under a British resident general, with the governor of the Straits Settlements as High Commissioner.

Strait-waistcoat, or **Strait-jacket,** a garment for restraining a lunatic, or one laboring under violent delirium. It has long sleeves, which are tied behind the body so that the arms cannot be extricated from them.

Stralsund (sträl-sönd), a seaport of Prussia; on a narrow strait called the Strela Sound, which divides the mainland from the island of Rügen; 67 miles N. W. from Stettin. It forms an island, connected with the mainland by bridges. Down to 1873 the place was a fortress of the first class. Many of the houses are finely gabled, which gives the town a quaint and ancient look. The most interesting building is the town house (1306), with a museum of antiquities from the island of Rügen. Stralsund carries on a large export trade in malt, corn, fish, wool, coal, groceries, etc, and manufactures leather, gloves, mirrors, earthenware, sugar, starch, oil, and playing cards. Pop. (1900) 31,083. Stralsund was founded in 1209, and became one of the most important members of the Hansa. During the Thirty Years' War it successfully withstood a terrible siege (1628) by Wallenstein; but in 1678 it capitulated to the Great Elector after a furious bombardment. It again opened its gates to Prussia and her allies in 1715, to the French in 1807, and to the Danes and others in 1809. The town was held by the Swedes from 1628 to 1814; in the year following (1815) Denmark gave it up to Prussia.

Stramonium. See THORN APPLE.

Strand Mole Rat, in zoölogy, the *Bathyergus maritimus,* from the Cape of Good Hope. It is about 10 inches long, tail two inches; fur grayish-white, yellowish on under surface. It frequents sandy localities near the seashore.

Strang, John, a Scotch author; born in Glasgow in 1795. He wrote: "Glasgow and its Clubs," containing notes of local history, anecdotes, etc.; "Life of Theodore Koerner," the German poet, with translations of some of his lyrics; "Germany in 1831"; and "Traveling Notes of an Invalid in Search of Health." He translated also from the German, "Tales of Humor and Romance." He died in Glasgow Dec. 8, 1863.

Strange, Sir Robert, a British engraver; born in Pomona, Orkney Isles, July 14, 1721. He studied law and attempted a seafaring life, but ultimately resolved to devote himself to painting. While thus engaged the rebellion of 1745 broke out, and he joined the Highland forces in Edinburgh, where he engraved a half-length portrait of the Pretender. After the battle of Culloden he went to France, gained a prize for design at Rouen, resided for some time at Paris, and in 1751 settled in London and became the founder of the English school for historical engraving. He received knighthood in 1787. His engraved plates number about 80. He died in London July 5, 1792.

Strangles, a disease attacking horses, generally between the ages of three and five years. It consists of an abscess, which occurs between the branches of the lower

jaw. It is considered contagious. The name is also applied to a similar infectious disease in swine.

Strangling Bug, a large water bug, *benacus griseus,* which made its appearance in New Jersey and other places in the summer of 1898. It was given the name of "strangling bug" from its tendency to fasten its hooked claws into the neck of its victim. It lives in the water in the daytime and comes out only at night. It attacks only in self-defense, and its bite is not poisonous.

Strangulation, an act of violence in which constriction is applied directly to the neck, either around it or in the forepart, in such a way as to destroy life. This definition obviously includes hanging which differs from other forms of strangulation, only in that the body is suspended. The direct cause of death in the great majority of cases is arrest of the respiration owing to pressure on the windpipe — *i. e.,* asphyxia. If much violence is used, death may be produced by direct injury to the upper part of the spinal cord from fracture or dislocation of the cervical vertebræ (as is now the rule in execution by hanging), or by syncope from shock, and in such cases must be almost instantaneous; on the other hand, if the constriction is so applied as to compress the great vessels in the neck and not the windpipe, as may happen in "garotting," it is due to coma, and is somewhat slower than in cases of asphyxia. Or if both vessels and windpipe are compressed, coma and asphyxia may both contribute to cause death. The internal appearances of the body after death are those of asphyxia, with specially marked congestion of the brain; the most constant external appearances are congestion of the face, with prominence of the eyes and protrusion of the tongue, and marks on the neck corresponding to the cord or other constricting agent.

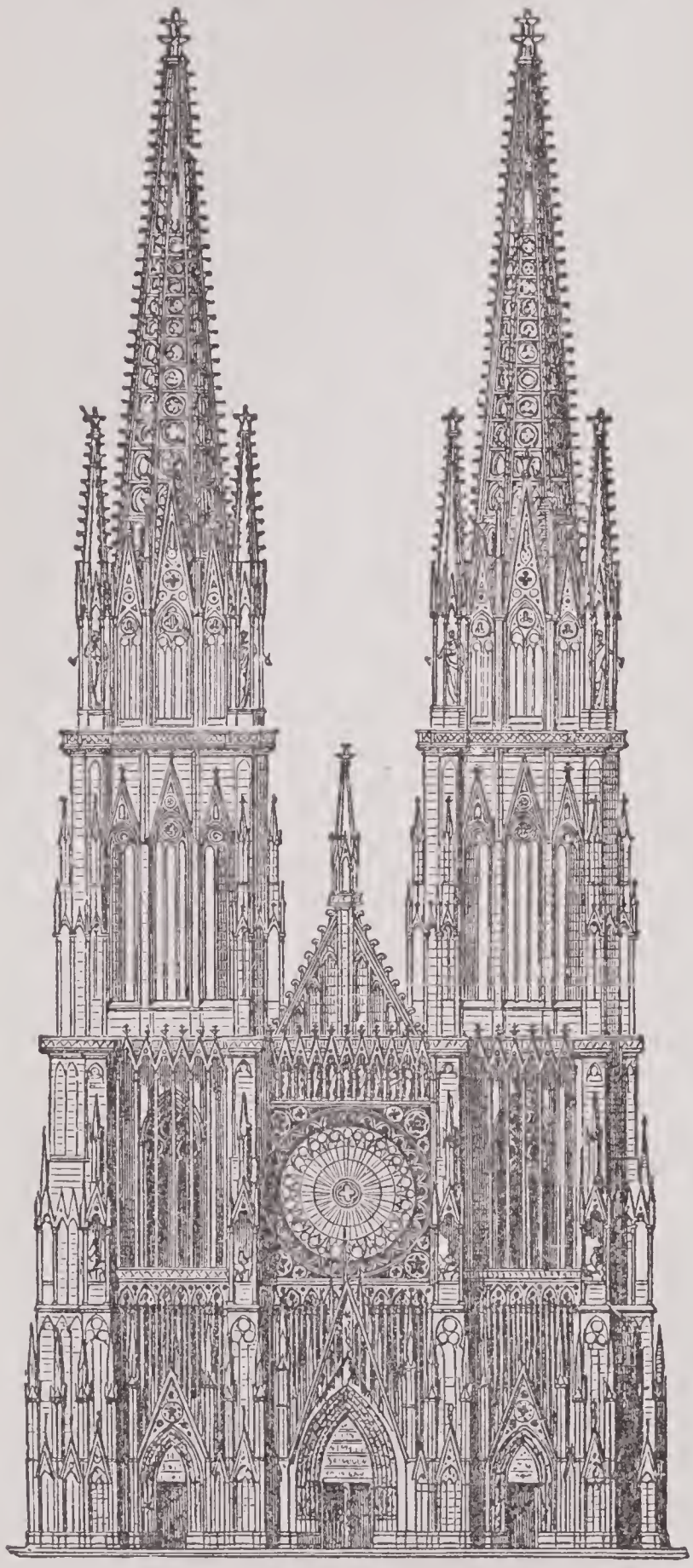
When suspension of the body has not continued for much more than five minutes, and the parts about the neck have not suffered violence, there is a probability that resuscitation may be established; though many cases are recorded when after only a few minutes' suspension it has been found impossible to restore life. Moreover, if a person who has hanged himself has been cut down sufficiently soon to allow of the respiratory process being restored, he is by no means safe: death often taking place from secondary effects at various periods after the accident. It is believed that unconsciousness comes on very rapidly, and death takes place without causing any suffering; the violent convulsions that are so often observed being similar to those which occur in epilepsy. In homicidal cases, however, the appearance of the face sometimes indicates much distress. A man named Hornshaw, who was on three occasions resuscitated from hanging — a feat which he performed in London for the amusement of the public — stated that he lost his senses almost at once; and other persons who have been restored state that the only symptoms of which they were conscious were a ringing in the ears, a flash of light before the eyes, then darkness and oblivion.

The treatment to be adopted after the patient has been cut down may be briefly summed up as follows: Exposure to a free current of air, cold affusion if the skin is warm, the application of ammonia to the nostrils, of mustard poultices to the chest and legs, and of hot water to the feet, and the subsequent abstraction of blood if there should be much cerebral congestion; above all, artificial respiration should be used if natural breathing do not at once commence. From the post-mortem appearances together with circumstantial evidence, the medical practitioner is not unfrequently called upon to decide such questions as these: Was death caused by hanging, or was the body suspended after death? Was the strangulation the result of accident, homicide, or suicide? In case of strangulation from other causes than that of hanging the post-mortem symptoms are similar, but the injury done to the parts about the neck is commonly greater. In manual strangulation the external marks of injury will be in front of the neck, about and below the larynx; and if death has been caused by a ligature the mark round the neck will be circular, whereas in hanging it is usually oblique. The internal appearances are much the same as in the case of hanging. See Asphyxia.

Strangury, a symptom of various affections of the urinary organs. It consists in a frequent and irresistible desire to pass water, the urine being discharged in small quantity and accompanied with scalding, cutting pains in the urethra, which sometimes extend to the bladder, the kidneys, and the rectum. Strangury may be caused by idiopathic urethrites, by gonorrhœa, or by such irritating substances as cantharides and oil of turpentine, or by gravel or calculus in the bladder. The principal treatment consists in the removal of the cause; and, in addition, the following means may be adopted. The warm sitz-bath, or hot fomentations over the bladder, should be applied, and an injection of starch and tincture of opium, a wine-glassful of the former to a drachm of the latter, should be administered. Mild, mucilaginous drinks of barley or rice water may be freely given to render the urine less irritating.

Stranraer, a royal burgh and seaport in Wigtownshire, Scotland, at the head of Loch

Ryan; 73 miles W. S. W. of Dumfries. The buildings are a 16th-century castle in which the bloody Claverhouse lived as sheriff, the new town hall and court house (1872–1873), and several handsome churches. There are no manufactures, but considerable trade in farm produce. Loch Ryan affords fair fishing. There is a small but constant shipping trade in bottoms belonging to the town, and a commodious mail steamer plies daily between Stranraer and Larne in Ireland, the "short-sea passage" merely taking about 2¼ hours, only half being in open channel. Pop. of royal burgh (1891) 6,193.



STRASSBURG CATHEDRAL.

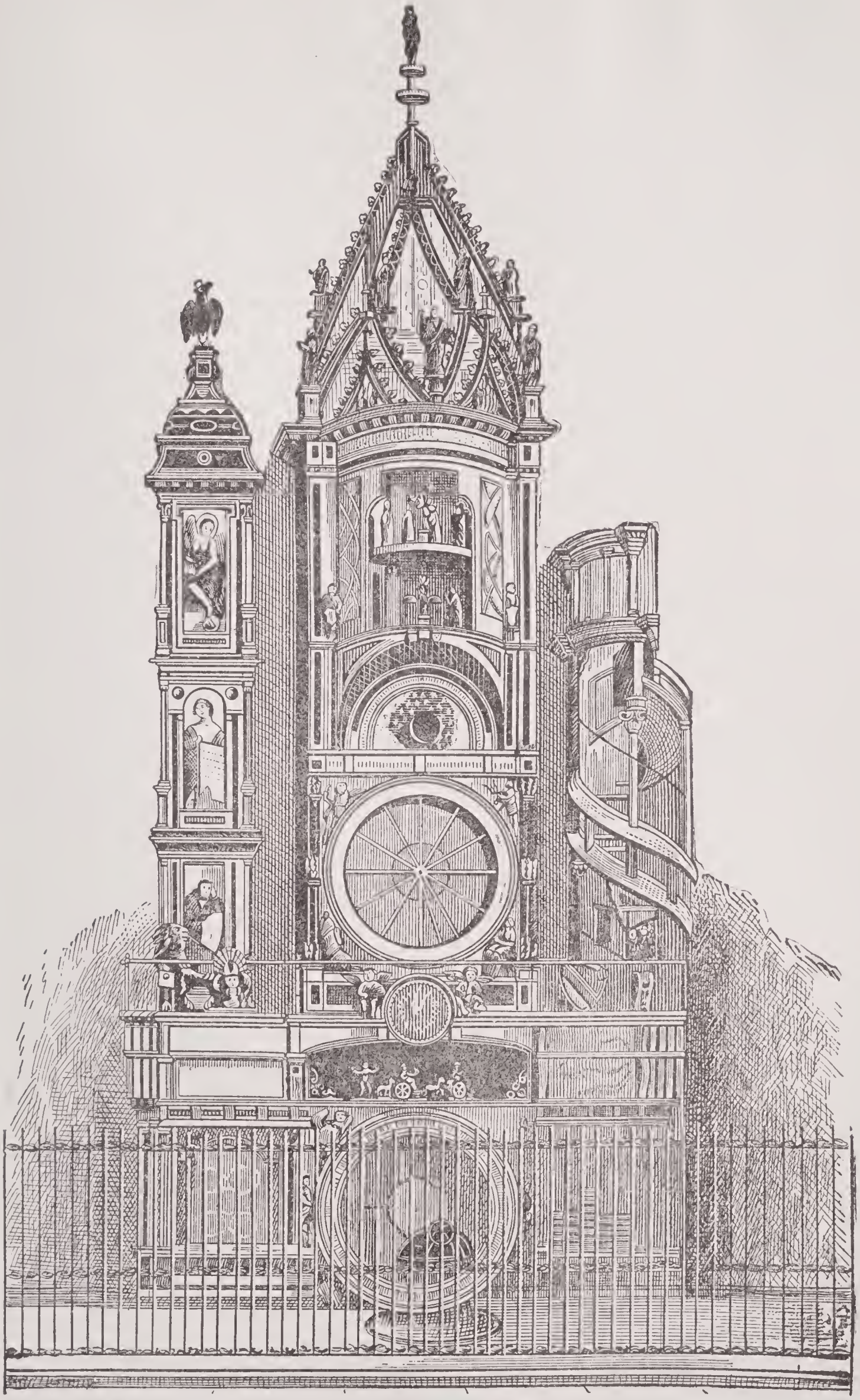
Strap, Strop, or **Strope,** a narrow band or strip of cloth, leather, or other material used to form a fastening; they are generally provided with a buckle, and are made in various forms; as, the strap of a shoe or boot, *i. e.*, a short strap conecting the two sides of each leg of a pair of trousers, by passing under the shoe or boot, the object being to keep the trousers well over the ankles.

Strappado, a barbaric military punishment, which consisted in having the hands of the offender tied behind his back, drawing him up by them to a certain elevation by a rope, and then suddenly letting him drop to within a short distance of the ground.

Strap Work, in architecture, a style of architectural ornamentation, representing a band or bands crossed, folded, and interlacing. There exist specimens of it, which must have been executed as long ago as the 11th century, but it was far more general in the 15th and 16th centuries.

Strass (named after the inventor, a German chemist), a name applied to an artificial compound used to imitate precious stones. Composition: silica, potash, and lead, with various metallic oxides according to the colors required. See STONES, PRECIOUS.

Strassburg, a town and fortress of Germany, in Alsace; capital of the territory of Alsace-Lorraine; on the Ill; about 2 miles W. of the Rhine, to which its glacis extends; 250 miles E. by S. of Paris, and about 370 miles S. W. of Berlin. By means of canals which unite the Ill with the Rhine, Rhone, and Marne, it is brought into communication with the Atlantic and the Mediterranean. It has always been regarded as a place of strategical importance, and strong fortifications and a pentagonal citadel were erected by Vauban in 1682–1684. Since the siege of 1870 by the Germans these have been considerably altered and strengthened, the new system of defense adopted including 14 detached forts situated from 3 to 5 miles from the center of the town. The streets in the older parts are irregular and quaint of aspect, but since the removal of part of the old fortifications the modern portions have greatly expanded. The chief building is the cathedral, a structure which presents the architectural styles of the cen-



ASTRONOMICAL CLOCK, STRASSBURG CATHEDRAL.

turies from the 11th to the 15th, in which it was built, but whose main element is Gothic. It is surmounted by towers 466 feet high, has a splendid W. façade, with statues and great rose window, fine painted glass windows, and a famous astronomical clock, made in 1547–1580. (See STRASSBURG CLOCK.) The other notable buildings are the Church of St. Thomas, the Temple-Neuf or Neukirche, the old Episcopal palace, the town hall, the new university building, opened in 1884, and the new imperial palace. The old Episcopal palace contains the university and town library, numbering 600,000 volumes. There are statues to Gutenberg and General Kléber, in squares correspondingly named, besides others. Its industries are very varied, and include tanning, brewing, machine making, woolen and cotton goods, cutlery, musical instruments, artificial flowers, gloves, chemicals, and the preparation of its celebrated *pâtés de foie gras*. Strassburg, under the name of Argentoratum, is supposed to have been founded by the Romans, who erected it as a barrier against the incursions of the Germans, who ultimately possessed it. In the 6th century the name was changed to Strassburg, and in the beginning of the 10th century it became subject to the emperors of Germany. United to France in 1681, it was ceded with the territories of Alsace and Lorraine to Germany in 1871. Pop. (1905) 167,678.

Strassburg Clock, a famous clock in the Strassburg Cathedral, representing the planetary system and its constellations. The little wooden images connected with the clock and going through their performance in illustration of a Biblical event, and, allegorically, the flight of time, have really given the clock its reputation. Every writer and observer has followed the fashion set by the first one who wrote about them — to whom, in all probability, they did appear wonderful — and praises their evolutions without stint. So that when one hears or thinks of the "Strassburg clock" he has a mental picture of a splendid pageant of automatons which are so skillfully and deftly constructed, and whose every motion is so perfectly natural as to almost deceive even the most observant.

But there is nothing very wonderful about the outside of the clock and one feels a little disappointed at the 12 or 15 feet high and 8 or 10 broad structure, its front adorned with rather dim decorations and cut up with various nooks, crannies, pigeonholes and galleries and with several wooden figures five or six inches high stuck around over it. At one side stands a tower surmounted by the figure of a rooster and containing the weights which give motive power to the whole mechanism. In the front of the main edifice, some three or four feet from the ground, are the dials which indicate the seconds, minutes, hours, days of of the week and month and the movements of the planets.

When the hour of noon arrives, a silvery-toned bell begins to strike the four quarters of the hour. At each stroke of the bell the figure of an angel raises a hammer held in his right hand and strikes a bell held in his left. At the side of the angel is the figure of a Genius which, as soon as the fourth stroke comes from the bell, turns over an hour glass and resumes his former immovable position beside it. Higher up is the figure of Death represented by a skeleton, and around the skeleton are grouped figures representing Boyhood, Youth, Manhood, and Old Age — the four quarters of the hour. The skeleton has a thigh bone in his right hand, and with it strikes the hours on a bell at his side. While Death is striking the 12 strokes of noon a door at the upper part of the clock suddenly opens and a figure of the Saviour appears and moves forward a few inches. Then at the left hand of this figure another door opens and a figure of one of the apostles appears. He moves forward a few inches, stops an instant, and then advances till opposite the Saviour. Here he makes a full stop, turns, faces the Saviour, makes obeisance, receives the benediction, resumes his journey toward an open door on the Saviour's left and disappears.

In the meantime a second apostle follows the first, goes through the same movements, and makes his exit in the same manner. So it goes on till all of the 12 apostles have passed in review. Then, the door having closed behind the last apostle, the figure of the Saviour raises its arms, bestows a blessing on the assembled tourists and passes out of sight. When the figure of the Apostle Peter appears, the chanticleer on the summit of the weight tower raises his head, ruffles the feathers on his neck in a very natural manner, claps his wings over his face till the whole cathedral reëchoes with the sound, claps them three separate, distinct and deliberate times, and proceeds to crow. Twice he repeats his crow with all the accessories. A working model of this clock was exhibited in the United States several years ago.

Strategy, the science, as distinguished from the art of war; the direction of a campaign; the combination and employment of his available forces, by a commander-in-chief, to bring a campaign to an end, as distinct from the minor operations by which it is sought to effect that result, and which are subsidiary to the general plan (see TACTICS). Also the use of artifice, stratagem, or finesse in carrying out any project.

Strategy, Board of, a board of United States naval officers organized at the commencement of the American-Spanish War in

1898, with headquarters at the Navy Department in Washington, D. C. The board consisted of four members, Rear-Admiral Montgomery Sicard, Capts. A. T. Mahan, A. S. Crowninshield, and A. S. Barker, all naval experts. The board had charge of the conduct of the war at sea and so far as possible directed the battles, leaving only the details to the fleet commanders. Constant telegraphie communication was kept up between the fleets and the board, and the general plan of the war as evolved by the latter was carried out as nearly as possible. The experiment was not only important from a technical point of view, but also historically interesting.

Stratford-on-Avon, a town of Warwickshire, England; 8 miles S. W. of Warwick; on the right bank of the Avon river. The river is here crossed by a fine bridge of 14 pointed arches, now nearly 400 years old, still known as Clopton Bridge, after its builder, Sir Hugh Clopton, an alderman of London but born in the neighborhood of Stratford, who is also interesting as the builder of the house called The New Place, which was the property of Shakespeare in his later years and the house in which he died, but was destroyed by the owner in 1759. The grounds are now open free. "Shakespeare's House," that is, the house in which he was born, having been purchased by subscription and dedicated to the public in 1847, was restored in 1859, and now contains the Shakespeare library and museum, the Stratford portrait, etc. In the cruciform parish church are his grave and portrait bust, also the font in which he was baptized. The old parish register with the entry of Shakespeare's baptism and burial, is shown near the N. door of the church. The central tower of the church dates from the 13th century. Other monuments are the Shakespeare Memorial Theater, built in 1879 at a cost of over $200,000, intended for occasional Shakespearean celebrations, and possibly as a dramatie college, and having attached to it, a Shakespeare library and museum; the Shakespeare fountain, built by an American, and the Shakespeare monument. Anne Hathaway's cottage, in the neighboring hamlet of Shottery, in the parish of Stratford, was acquired in the publie interest in 1892. Among other interesting remains of Shakespeare's time or memorials of Shakespeare are the grammar school in which he was educated (originally endowed in 1482, refounded under Edward VI.), the adjoining Guildhall, in which strolling players used to perform in Shakespeare's time (both buildings restored since 1891), the town hall (rebuilt in 1768 on the site of an older structure of 1633), containing in a niche on its N. side the statue of Shakespeare presented by David Garrick. Apart from Shakespeare, the town is interesting as containing the early home of the mother of John Harvard, founder of America's oldest university. There are several interesting places besides those in and about Stratford, among these the cottage of Mary Arden (the poet's mother), at Wilmcote. The town owes its name to the old ford of the Avon parallel to the bridge on the road from London to the N. W.

Strathclyde, a former independent kingdom in Scotland. In the 8th century the ancient confederacy of the Britons was broken up into the separate divisions of Wales and English and Scotch Cumbria. Scotch Cumbria, otherwise called Strathclyde, thenceforth formed a little kingdom, comprising the country between Clyde and Solway, governed by princes of its own, and having the fortress town of Alclyde or Dumbarton for its capital. Becoming gradually more and more dependent on Scotland, it was annexed to the Scottish crown at the death of Malcolm I. On the death of Alexander I., without issue in 1124, it was permanently united to the Scotch kingdom under David I.

Strathcona and Mount Royal, Donald Alexander Smith, 1st Baron, a Canadian statesman; born in Scotland in 1820; entered the service of the Hudson Bay Company at an early age, and was the last resident governor of that corporation as a governing body. He was special commissioner during the first Riel rebellion in the Red River settlements in 1869–1870; a member of the first executive council of the Northwest Territory; represented Winnipeg and St. John's in the Manitoba Legislature in 1871–1874; and was a member of the Canadian House of Commons for Selkirk in 1871–1872, 1874, and 1878, and for Montreal West in 1877–1896. He was a director of the St. Paul, Minneapolis, and Manitoba Railway; the Great Northern Railway of Minnesota; and the Canadian Pacific Railway Company; and intimately connected with many other corporations and organizations. He was made High Commissioner for Canada in 1896. He has been a generous patron of Canadian institutions.

Strathfieldsaye, an estate in Hampshire, England, with a Queen Anne mansion, overlooking the Loddon, 7 miles N. N. E. of Basingstoke. Associated before that with the name of Pitt, it was purchased by Parliament in 1817 of Lord Rivers for $1,315,000 and presented to the Duke of Wellington.

Strathmore, the general name given to the extensive valley of Scotland which stretches N. E. from Dumbartonshire to Kincardineshire, having on one side the Grampians and on the other the Campsie, Ochil, and Sidlaw Hills; but it is popularly

limited to the district which stretches from Methven in Perthshire to Brechin in Forfarshire.

Strathnairn, Hugh Ross, Baron, an English soldier; born in Berlin, Germany, March 8, 1803; entered the army in 1820, organized the Turkish defense in 1840, was consul-general for Syria. and in 1848 became secretary to Lord Stratford de Redcliffe. He served in the Crimean War and the suppression of the Indian mutiny, succeeded Lord Clyde as Commander-in-Chief in India, and from 1865–1870 was Commander-in-Chief in Ireland. He was raised to the peerage in 1866 and made Field-Marshal in 1877. He died in London Oct. 16, 1885.

Strathspey, a Scotch dance, allied to and danced alternately with the reel. The name is derived from the strath or valley of the Spey, where it seems to have originated; but it does not occur before the middle of the 18th century, and was at first applied indiscriminately to music now known as reels. It differs from the latter in being slower, and abounding in the jerky motion of dotted notes and semiquavers, while the reel is almost entirely in smooth, equal, gliding motion. Many of Burn's songs were written to the music of strathspeys.

Stratigraphy, that department of geology which deals with the disposition or arrangement of strata, or the order in which they succeed each other.

Stratiomyidæ, in entomology, a family of *Notacantha*. Antennæ three jointed and having in most cases a terminal stylet with five or six rings. When this is absent, the third articulation is long and fusiform. Wings in many species couched one upon the other. There are two sub-families — *Stratiomyinæ* and *Xylophaginæ*.

Stratiomyinæ, a sub-family of *Stratiomyidæ*. Abdomen with five free segments.

Stratiomys, in entomology, the typical genus of *Stratiomyidæ*. The best-known species is *S. chamælcon*, a large, handsome fly, a little more than half an inch long, the color brassy black, with tawny hairs; the scutellum yellow, with two long spines; the abdomen black with yellow spots and bands. The female deposits her eggs on the lower side of the water plantain, *Alisma plantago;* the pupa floats like a boat.

Stratiotes, in botany, the water soldier; the typical genus of *Stratiotæ*. Only known species, *S. aloides*, a stoloniferous submerged diœcious herb, with the leaves, which are all radical, triangular, aculeate, serrate; the scape four to six inches long, compressed, two-edged; the perianth six-parted, white; the stamens 12 or 13, with 23 or 24 staminodes; six stigmas, and a six-celled, many-seeded, baccate fruit. It is a very ornamental plant. It remains under water during the greater part of the year; but appears on the surface at the time when the seeds require to be fertilized.

Stratopeite, an amorphous mineral resulting from the alternation of rhodonite, the manganese passing from protoxide to sesquioxide. Dana makes it a variety of neotocite, but it is a doubtful compound. Found with rhodonite at Filipstad, Sweden.

Stratus, in meteorology, a very large and continuous horizontal sheet of cloud, looking, in many cases, as if it rested on the ground. It occurs chiefly at sunset and disappears at sunrise. It is common in autumn, but rare in spring.

Stratum, a bed or mass of matter spread out over a certain surface, in most cases by the action of water, but sometimes also by that of wind. The method in which stratification by the agency of water has been

STRATUM:

The series of strata represented in the lower half of the figure were, after the deposition of the entire series, bent into mountain folds and raised above the sea, after which the resulting land surface was deeply denuded, and the whole area was then depressed again beneath the sea, to receive the undisturbed strata represented in the upper half of the figure.

STRATUM:

Theoretical diagram showing how a "discordance" sometimes results from the uplifting and "faulting" of the older strata, followed by a period of atmospheric "denudation," then a submergence and deposition of later sediments.

effected in bygone times may be understood by a study of the manner in which successive layers of gravel, sand, mud, etc., are deposited in a river or running brook. The same process has been at work through untold periods of time. The greater part of the earth's crust, in nearly every land, is found to be thus stratified. Strata may be CONFORMABLE (*q. v.*), or UNCONFORMABLE (*q. v.*). In the former case there generally is a considerable approach to parallelism among them. It is, however, inferior in exactness to that of cleavage planes. Strata laid down by water, as a rule, retain fossil remains of the animals and plants imbedded in them when they were soft and plastic. Metamorphism generally destroys those organic remains, but leaves the stratification undisturbed; thus there are two kinds of strata — sedimentary and metamorphic — nearly synony-

mous with fossiliferous and non-fossiliferous stratified rocks. Most strata have a dip and a strike. The fossils will in most cases show whether strata are lacustrine, fluviatile, or marine. They prove that deposit was very slow. One stratum may overlap another, or a stratum may thin out, or an outcrop of it may exist. As a rule, the lowest are the oldest, but some great convulsion may have tilted over strata in limited areas, so that the oldest have been thrown uppermost. A study of the same beds over a wide expanse of country prevents error in estimating the relative age of strata thus reversed. The thickness of the stratified rocks is believed to be about 20 miles, or 100,000 feet. They are not all present at one place, or even in one country. Though a surprisingly large number are to be found in America, yet some foreign beds require to be inserted in the series, and even then great gaps remain, each representing a lapse of time. See GEOLOGY; SUPERPOSITION.

Straus, Oscar Solomon, an American diplomatist; born in Ottenberg, Rhenish Bavaria, Dec. 23, 1850; came to the United States in 1854 and was graduated at Columbia University in 1871. Subsequently he entered mercantile life. In 1887 he was appointed United States minister to Turkey. He was president of the New York Board of Trade and Transportation; a member of several historical and sociological societies, and the author of a number of books dealing with religion and history. In 1898 he was again appointed minister to Turkey, which office he held till 1900; and on Jan. 14, 1902, President Roosevelt appointed him a permanent member of the Committee of Arbitration at The Hague; in 1906 he became Secretary of Commerce and Labor; and in 1909 Ambassador to Turkey.

Strauss, David Friedrich, a German theologian; born in Ludwigsburg, Würtemberg, Jan. 27, 1808; studied in Tübingen University; became assistant to a country clergyman in 1830; was appointed temporary professor in the seminary at Maulbronn; resigned this position and went to Berlin in 1831 to study under Schleiermacher and Hegel; returned to Tübingen and lectured on logic and philosophy; and published in 1835 his famous "Life of Jesus," in which he attempted to prove that the Gospel narratives had a mythical origin and growth. To his numerous critics he replied in "Polemical Writings," and "A Pacific Pamphlet." Appointed in 1839 to the chair of dogmatic theology in Zürich he was prevented from entering on his duties by a storm of popular indignation, but received a small pension in recompense. His subsequent writings were: "Christliche Glaubenslehre" (1839–1841); "Life of Schubert" (1849); "Life of Christian Märklin" (1851); "Life of Ulrich von Hutten" (1858–1860); "Life of Jesus for the German People" (1877); "The Christ of Faith and the Jesus of History" (1865); and "The Old and the New Faith" (1872), in which he defines his final attitude to Christianity, that being now entirely hostile. His more important works have been translated into English. He died in Ludwigsburg Feb. 8, 1874.

Strauss, Johann, an Austrian musician; born in Vienna Oct. 25, 1825; began the composition of waltzes at the age of six, and before he was 18 organized and conducted an orchestra and captivated the Vienna public with waltzes and polkas of his own composition. After composing dance music for many years, he undertook an operetta, "Indigo," which was produced in 1871, and met with instantaneous success. Subsequently he produced "The Forty Thieves"; "Cagliostro"; "A Night in Venice"; "The Gipsy Baron" (operettas that became popular not only in Austria but in other countries); and numerous waltzes, the best known being "The Beautiful Blue Danube." He died in Vienna June 3, 1899.

Strauss, Joseph, an American naval officer; born in Mount Morris, N. Y., Nov. 16, 1861; was graduated at the United States Naval Academy in 1881; cruised in various parts of the world in 1885–1887; engaged in hydrographic surveys in 1887–1890; and served in the Naval Bureau of Ordnance in 1890–1893. He invented, with Admiral Sampson, the superposed turret system of mounting guns on battleships in 1895; cruised in South American waters in 1896–1900; and engaged in the blockade of the Cuban coast in 1898. On Jan. 3, 1900, he was placed in charge of the United States Naval Proving Ground at Indian Head.

Straw. Apart from the importance of the straw of various cereal plants as a feeding and bedding material in agriculture, such substances also possess no inconsiderable value for packing merchandise, for thatching, for making mattresses, and for door mats. Straw is also a paper-making material of some importance, and split, flattened, and colored it is employed for making a mosaic-like veneer on fancy boxes. But it is the form of plaits that straw finds its most outstanding industrial application, these being used to an enormous extent for making hats, and bonnets and for small baskets, etc. Wheaten straw is the principal material used in the plait trade, the present great centers of which are Bedfordshire in England, Tuscany in Italy, and Canton in China. At first the plait was what is called whole straw; that is, straw was cut into suitable lengths without knots, and merely

pressed flat during the operation of plaiting; and so continued till the reign of George I., when it was in great demand for ladies' hats, and some plait was made of split straw. Since that time split straw has been chiefly used.

The English straw used in plaiting is obtained principally from the varieties of wheat known as the White Chittin and the Red Lammas, which succeed best on the light rich soils of Bedfordshire and the neighboring counties. Only bright, clear, and perfect pipes can be employed, and to obtain the straw in good condition great care has to be exercised. The crop is not mowed, but pulled up, and the ears are cut off by the hand for thrashing. The straws are then cut into lengths, cleared of their outer sheath, and assorted into sizes in a kind of sieve apparatus. The finest and most costly plaits anywhere made — the Tuscan and Leghorn plaits — are made in Tuscan villages around Florence, and are not split. The straw there used — very fine in the pipe and bright in color — is produced from a variety of wheat thickly sown and grown in a light thin soil. The crop is pulled and prepared as in the English trade, and the plaits are worked by all classes and ages of the rural populace. The finer qualities of Tuscan plaits are worked with exceeding delicacy and elaboration, the task so straining the eyesight of the plaiters that they can give not more than two hours daily to the work. Within recent years an enormous amount of straw plait, of a common but useful quality, has been sent into the European market from China, the port of shipment being Canton. The exports of straw manufactures from the United States in the calendar year 1909 were valued at $546,445; imports at $596,323.

Straw Bail, worthless security furnished by an offender against the law for his appearance for trial, the bonds given being fraudulent statements of property owned by the person offering it.

Strawberry, a well-known fruit and plant of the genus *Fragaria,* natural order *Rosaceæ.* It is remarkable for the manner in which the receptacle, commonly called the fruit, increases and becomes succulent; but the true fruit is the small seeds or achenes on the surface of the receptacle. The species are perennial plants throwing out runners which take root and produce new plants; they are natives of temperate and cold climates in Europe, America, and Asia. The following species afford the varieties of cultivated strawberries: (1) Wood strawberry (*F. vesca*), found wild in woods and on hillsides throughout Europe, and now cultivated in gardens, as the red, the white, the American, and Danish Alpine strawberries. (2) The Alpine strawberry (*F. collina*), a native of Switzerland and Germany. The varieties of strawberries called green are the produce of this species. (3) Hautbois strawberry (*F. elatior*), a native of North America. (4) Virginian strawberry (*F. virginiana* or *caroliniana*), a native of Virginia. To this species belongs a great list of sorts cultivated in gardens, and known by the name of scarlet and black strawberries. (5) Large-flowered strawberry (*F. grandiflora*) is supposed to be a native of Surinam, and to have furnished our gardens with the sorts called pine strawberries. (6) Chile strawberry (*F. chilensis*), a native of Chile and Peru, and the parent of a number of mostly inferior strawberries. Strawberries are much valued for dessert, and for purposes of jam making. The strawberry thrives in any good garden soil, and is propagated by seeds, by division of the plant, and by runners.

Strawberry Pear, a plant of the cactus family, the *Cereus triangularis,* which grows in the West India Islands. Its fruit is sweetish, slightly acid, pleasant, and cooling.

Strawberry Tomato, the name of a plant of the genus *Physalis* (*P. Alkekengi*), natural order *Solanaceæ,* known also as winter cherry, cultivated for its fruit, which is of a bright red color, of the size of a small cherry, and makes a delicate sweetmeat.

Strawboard, a kind of millboard, or thick cardboard, made of straw after it has been boiled with lime or soda to soften it. The cheap kinds of strawboards are used for making common boxes of various kinds, and for protecting articles sent by post or railway. Good qualities of board suitable for binding books and other purposes are made of straw mixed with flax and jute waste from spinning mills.

Straw Plait, or **Straw Plat,** a plait or braid formed of straw, chiefly of rye, plaited together, and generally from half to an inch wide. These plaits when sewn together are used to form different descriptions of ladies' bonnets, hats for both sexes, etc. For hats the whole straw is used; for bonnets it is split and the part under the husk removed. The braids are plaited with from 11 to 13 straws each. Their length is from 300 to 320 feet, their width and the quantity of straw entering into them varying according to quality.

Straw Underwing, in entomology, a European night-moth, *Cerigo cytherea,* the hinder wings of which are straw-colored, with a broad smoke-colored marginal band. The larva feeds on the grasses which grow on dry and stony hills; the chrysalis is subterranean.

Stray Line, in navigation, a portion of the log line, say 10 fathoms, between the log chip and the first knot, and left unmarked in order to allow the latter to get out of the eddy in the ship's wake before turning the glass. When the stray mark is reached, the glass is turned and counting commences.

Stream Tin, or **Stream Tin Ore,** in mineralogy, a variety of *Cassiterite*, occurring as waterworn grains or pebbles in the beds of streams, obtained from granitic rocks by their disintegration.

Streamer, in entomology, a handsome European geometer moth, *Anticlea derivata*. Wings with a delicate gloss, the forepair purple-brown, with markings, the hinder pair gray, with few markings; expansion about an inch. The caterpillar feeds on the buds and stems of the dog rose in June and July, the perfect insect appearing in the following April and May. In mining, a person who works in search of stream tin.

Streator, a city in Lasalle co., Ill.; on the Vermillion river, and on the Burlington Route, the Chicago and Alton, the Wabash, the Indiana, Illinois, and Iowa, and the Atchison, Topeka, and Santa Fé railroads; 93 miles S. W. of Chicago. It is the trade center of a large agricultural and coal district. There are also valuable clay deposits in the city. Here are a high school, public library, waterworks, street railroad and electric light plants, several National banks, and a number of daily and weekly newspapers. The city has extensive glass works, foundries, machine shops, flour mills, planing mills, brick works, etc., and an assessed property valuation exceeding $1,000,000. Pop. (1900) 14,079; (1910) 14,253.

Street, Alfred Billings, an American author; born in Poughkeepsie, N. Y., Dec. 18, 1811. In 1839 he removed to Albany, N. Y., where he practised law for a number of years. Among his best known poems are "The Burning of Schenectady" (1842); "Drawings and Tintings" (1844); "Fugitive Poems" (1846); "Frontenac" (1849). He also wrote "The Council of Revision" and "Woods and Waters," the latter descriptive of the Adirondack Mountains and other portions of Northern New York. He died in Poughkeepsie, N. Y., June 2, 1881.

Street, George Edmund, an English architect; born in Woodford, England, June 20, 1824. Having studied architecture under Sir G. Gilbert Scott, in 1850 he began work on his own account. He favored the English Gothic style, and in this his principal works were built. The chief of these were the new law course in the Strand, London, for which he was appointed architect in 1868, after competition. He was a member of the British and American Institutes of Architecture, and a Royal Academician (1871). He published "The Brick and Marble Architecture of North Italy in the Middle Ages" (1855), and "Some Account of Gothic Architecture in Spain" (1865). The dioceses of Oxford, York, Ripon, and Winchester had him retained as architect. He died Dec. 18, 1881.

Street Railways, iron ways laid along a road, or the streets of a town or city, on which cars for passengers are drawn by horses, steam, electricity, or other mechanical means. The first use of cable cars was in San Francisco, Cincinnati, and other Western cities, where the steep grade of certain streets rendered horse cars impracticable. Later they were generally adopted throughout the United States as a substitute for horse cars on account of their greater efficiency. Electricity was employed in storage batteries and by means of overhead trolleys, but the most satisfactory form is that of the underground trolleys, which have been adopted by most of the large cities. See ELECTRIC TRACTION.

Strehlenau, Nicolaus Niembsch von. See LENAU, NICOLAUS.

Strelitz, the life guards of the Russian czars, instituted by Ivan the Terrible in the middle of the 16th century. Peter the Great dissolved the corps in 1697 in consequence of an insurrection, put several thousands to death, and banished the rest to Astrakhan. Having been guilty of some disturbances here they were entirely dispersed and destroyed in 1705.

Strelizia, a genus of plants, order *Musaceæ*, consisting of large herbaceous plants, natives of the Cape of Good Hope. Their foliage consists of long stalked leaves, sheathing at the base, arising from a contracted stem, the flower stalk encircled below by the sheath of the leaf stalk, while its upper portion gives origin to a large bract or spaths placed obliquely, within which are the flowers. The fine leaves and large orange and purple flowers of *S. reginæ* render it one of the most splendid of plants.

Strengite (after Prof. A. Streng, of Giessen), an orthorhombic mineral occurring in small spherical groups of radiating fibers, rarely in crystals; hardness, 3–4; sp. gr., 2.87; luster, vitreous; color, shades of red. Composition: Phosphoric acid, 37.97; sesquioxide of iron, 42.78; water, 19.25 = 100, which gives the chemical formula $[Fe_2]P_2O_8 + 4aq$.

Strength of Materials, in mechanics, an important part of the theory of structures, and includes the consideration of all questions relating to the straining of solids. A solid is said to suffer strain when it is in any way altered in volume or figure, and to

Strength of Materials

effect such an alteration external force must be applied. If the strain is not carried so far as to cause disintegration of the solid — that is, if no fracture results — the force or resultant of the forces which produce the strain must be balanced by an internal force conditioned by the molecular structure of the solid. This internal force called into existence by the strain is the one aspect of the stress, of which the original force producing the strain is the other. To every strain, then, there corresponds a stress, which is regarded as the resultant of the stresses which act between the elementary portions into which the solid may be supposed to be divided. When the strain is proportional to the stress — in other words, when Hooke's law holds — the body strained is said to be perfectly elastic; and the elasticity of every solid, even for such cases as moistened clay, is sensibly perfect when the strain does not exceed a certain limit. For every solid, however, there are limits of strain which, if exceeded, give to the body a set or permanent alteration of volume or figure. Hodgkinson has proved that these limits depend on the duration of the strain, so that in all probability any strain if sufficiently long-continued would give a set to any body.

There are several distinct kinds of strains to which a solid may be subjected, and these are given with their corresponding fractures in the following table taken from Rankine's "Applied Mechanics":

	Strain.	Fracture.
Longitudinal.	Extension.	Tearing.
	Compression	Crushing and Cleaving.
Transverse.	Distortion.	Shearing.
	Torsion.	Wrenching.
	Bending.	Breaking across.

The simplest example of resistance to stretching is afforded by a uniform bar subjected to a stress acting along its axis, say a suspension rod with a mass attached to its lower end. The stress is here measured by the weight which produces the longitudinal strain; and each unit of length of the bar will suffer an extension, which within a certain limiting stress will bear a constant ratio to the stress. In other words, the modulus of elasticity or ratio of the stress to the extension per unit length of the rod will be nearly constant till the stress passes the elastic limit, which is defined generally as the greatest stress of which a strained solid can bear the repeated application without its strength being impaired. After this limit the extension increases faster than the stress till the breaking stress is reached, when the bar is torn asunder.

In experimentally determining these constants for a given material, the stresses must be applied gradually; for it is found that a stress, which when suddenly applied produces fracture, can be resisted by the solid when applied gradually. Now, the work done by the stress is measured by the product of the strain into the mean stress in its own direction; and hence the work done in straining a solid to the limit of proof strain is measured by the product of the strain into half the elastic limit in the direction of the strain, which in most cases may be taken as a measure of the mean stress. In the case of the bar, this product (technically known as the resilience or spring of the bar) is the extension multiplied by half the elastic limit. The strains to which boilers and pipes are subject under the pressure of the contained fluid belong to the same class of longitudinal strains as the stretching of a bar does, but their discussion is necessarily much more complicated. Resistance to compression is sensibly equal to resistance to extension, as long as the limit of the elastic limit is not exceeded. When, however, that limit is exceeded, the various modes in which the crushing may occur make the determination of the resistance difficult. Thus the strained body may split into fragments in the direction of the crushing force; or it may yield by bending or by shearing or sliding along oblique surfaces of separation; or it may swell laterally, like lead or wrought iron; or it may crush by crossbreaking, very similar to the crossbreaking of a beam under a transverse load. In these cases transverse strains are introduced, which accordingly fall to be considered.

A shear is a strain produced by a tangental stress, which may or may not be constant in intensity and direction. In many ordinary structures in which plates, links, or bars are subjected to a direct pulling stress, the rivets or bolts which fasten them together are under the action of a shearing stress; and in such cases it is of importance that the pieces and their fastenings should be of equal strength. The nature of a simple shear is well shown geometrically by two parallelograms on the same base and between the same parallels, the alteration of form being simply a sliding of the elementary portions over each other with the displacement proportional to the distance from the base, in the direction of which the shearing stress may be supposed to act. Except in very special cases, shearing invariably accompanies the last two kinds of transverse strains — torsion and bending. For instance, take the case of a horizontal beam in equilibrium under the action of the weight of its load, either applied at detached points or continuously distributed, and the pressures at its props, and consider any transverse section dividing the beam into two parts.

The resultant of the forces acting over one only of these parts will have a shearing action at the cross section, to resist which

the particles at the cross section must be able to exert an equal and opposite shearing stress; and, further, the moment of this resultant, taken with reference to the cross section, or the bending moment exerted at the cross section, must be balanced by an equal and opposite moment of resistance exerted by the particles at the cross section. When the beam is bent the side toward which the resultant external force acts is stretched and the other side compressed. Intermediate to these, there must be some layer in the beam which is neither lengthened nor shortened. This is called the neutral surface; and at any other layer a longitudinal stress is called into action, which within the limits of proof stress, is proportional to the distance of the layer from the neutral surface. This stress is a pull or tension if the surface is stretched, a pressure or thrust if compressed; and this uniformly varying stress at any given cross section constitutes a couple whose moment is equal and opposite to the bending moment at the cross section. In the case of torsion, take a cylinder subjected to the twisting moment of a pair of equal and opposite couples applied to two given cross sections. Between these cross sections there is evidently distortion, and similar conditions of stress and strain exist at all intermediate cross sections; and the stress in any cross section is a shearing stress, which is proportional to the distance from the axis.

Strepsiceros, in zoölogy, the koodoo; the type-genus of *Strepsicerœ*, with spiral-keeled horns. There is a single species, *S. kudu*, often included in the genus *Tragelaphus*. Sir Victor Brooke, in his arrangement of the revised family *Bovidæ*, has a sub-family (*Tragelaphinæ*) of the same extent as the old *Strepsicerœ*.

Strepsilas, in ornithology, a genus of *Charadriidæ*, by some authorities made the type of a sub-family, *Strepsilatinæ*. Beak strong, forming an elongated cone as long as the head; nostrils basal, lateral, lineal, pervious, partly covered by a membrane; wings long, pointed; feet four-toed, three in front (united by a membrane at base) and one behind. There are two species, almost cosmopolitan.

Strepsiptera, a small and very peculiar and anomalous order of insects. The females are wingless, and live as parasites in the abdomen of bees, wasps, and other hymenopterous insects. The males have the front pair of wings in the form of twisted filaments, the posterior pair are fan-shaped and membranous. The jaws are rudimentary. The heads of the parasitic females protrude from between the abdominal joints of their host. The strepsiptera are viviparous, and the larvæ are little caterpillars which attach themselves to the bodies of wasps and bees. The female larvæ never leave their hosts; the male larvæ undergo their metamorphosis within the bodies of their hosts, from which in due time they emerge as perfect winged males. *Stylops Dalii* and *S. Spencii* are common species.

Strepsirhina, one of the three chief divisions into which the order *Quadrumana* or monkeys is sometimes arranged, represented by such forms as the aye-aye or cheiromys of Madagascar, by the lemurs, loris, etc.

Stress, a convenient term introduced by Professor Rankine to express the mutual action between any two portions of matter. Thus the pressure between a table and a book resting on it is of the nature of a stress, which has two aspects, acording as we fix our attention on the table or the book. With reference to the former the pressure is downward, with reference to the latter upward, and these two forces, which according to Newton's third law are equal and opposite, form when regarded as a whole the stress. Similarly the attraction of the earth for the sun and the attraction of the sun for the earth are opposite aspects of the same stress, and the same can be said of all forces which obey Newton's third law, *i. e.*, of all known forces which invariably exist in pairs. The so-called centrifugal force is merely the one aspect of the stress whose other aspect is the force which acts upon the body normally to the path. See STRAIN: STRENGTH OF MATERIALS.

Stretto, in music, means closely, concisely, in a quicker style, the opposite of largo. A stretto in a fugue is the bringing closely together the subject and its answer; as, for instance, the entry of the answer into the fugue before the close of the subject. A stretta is a final coda to a piece taken in quicker time than the preceding movements, or the termination of an operatic finale.

Stretching Machine, in manufacturing, a machine for stretching calicoes and other similar textile fabrics for the market. The machine lays all their warp and wool yarns in parallel positions, and extends their width after the shrinkage caused by bleaching, dyeing, etc.

Stretton, Hesba, an English novelist; born in Wellington, Shropshire. She wrote many novels and stories; including: "Jessica's First Prayer" (1866); "The Clives of Burcot" (1867); "Paul's Courtship" (1867); "Hester Morely's Promise" (1868); "Bede's Charity" (1882); "The Highway of Sorrow"; "Soul of Honor"; etc.

Striated Fiber, in anatomy, the primitive fibers composing ordinary muscle. They

have two sets of markings; one longitudinal and the other transverse. In general, when a fiber is resolved into fibrillæ, the cleavage is in the direction of the longitudinal, though sometimes it is in the direction of the transverse fibers. Striated fiber constitutes the voluntary muscles, comprehending those of locomotion, respiration, expression, etc.

Striated Rocks, or **Striated Bowlders,** rocks or bowlders with striæ along their surface, the result of the passage over them of masses of ice with projecting stones imbedded in the lower part. Such striated rocks exist along the sides and at the foot of mountain ranges wherever glaciers have descended. They are found also in the Arctic and temperate zones wherever ice has passed from the N. during the glacial period.

Strickland, Agnes, an English historian; born in Reydon Hall, Suffolk, England, Aug. 19, 1806. He first work, aided by her sister Susannah, was a volume of "Patriotic Songs," followed by "Worcester Field," a historical poem. She wrote: "Queen Victoria from Her Birth to Her Bridal" (1840); "Historic Scenes and Poetic Fancies" (1850); "Lives of the Bachelor Kings of England" (1861); "Lives of the Seven Bishops" (1866); "Lives of the Tudor Princesses" (1868). Her best works are "Lives of the Queens of England" (12 vols. 1840–1848), and "Lives of the Queens of Scotland" (8 vols. 1850–1859). She died in Reydon Hall July 8, 1874.

Strict Observance, in Church history, the name given to a subdivision of the Observantine branch of the Franciscan order. The first house of Strict Observance appears to have been founded by a Spanish Franciscan, John de Puebla, on the Sierra Morena in 1489. The friars soon became a separate congregation and spread to Italy, where they were known as the Reformed, early in the 16th century. They established themselves at Nevers in France in 1597, and were there called Recollects. The Latin holy places at Jerusalem are under the charge of the Franciscans of the Strict Observance.

Stricture, a term employed in surgery to denote an unnatural contraction, either congenital or acquired, of a mucous canal, such as the urethra, œsophagus, or intestine. When, however, the affected part is not mentioned, and a person is stated to suffer from stricture, it is always the urethral canal that is referred to. Contraction of this canal may be either permanent or transitory; the former is due to a thickening of the walls of the urethra in consequence of organic deposits and is hence termed organic stricture; while the latter may be due either to local inflammation or congestion, or to abnormal muscular action; the first of these varieties may be termed inflammatory or congestive stricture, and the second spasmodic stricture. The last named form seldom exists except as a complication of the other kinds of stricture. There are two principal causes of organic stricture — the first being inflammation of the canal, and the second injury by violence. Inflammation is by far the most common cause, and gonorrhœa is the common agent by which it is excited. Not unfrequently stimulating injections thrown into the urethra with the view of checking the gonorrhœal discharge excite an inflammatory action which gives rise to stricture. Fortunately it is only in exceptional cases that a stricture results from inflammation of the urethra, the inflammation in the great majority of cases terminating by resolution, and leaving the canal as healthy as before the attack. It is when the complaint assumes a chronic character that it most commonly lays the foundation of stricture. Stricture from the second cause arises from such causes as falling across spars, scaffolding, ladders, etc., or from some sharp object which punctures the perinæum.

The earlier symptoms of stricture are a slight urethral discharge and pain in the canal behind the seat of the stricture at the time of micturition. The stream of urine does not pass in its ordinary form, but is flattened or twisted; and as the disease advances it becomes smaller, and ultimately the fluid may only be discharged in drops. The straining efforts to discharge the urine often induce tenesmus. As the case advances the urine becomes alkaline and ropy, and deposits a precipitate when allowed to stand; and attacks of complete retention of urine occur with increasing frequency. But these symptoms are not in themselves sufficient to establish the presence of stricture. It is necessary to examine the urethral canal with a catheter or bougie to ascertain whether an organic obstruction exists, whether one or more strictures are present (as many as eight have been recorded, though four are rare, and one is the most common number), and their caliber. The treatment of organic stricture is too purely surgical to be discussed in these pages. It is sufficient to state that its object is twofold — viz., (1) to restore the natural caliber of the canal; so far as this can be safely effected; and (2) to maintain this patency after it has been established.

Spasmodic stricture usually occurs as a complication of organic stricture or of inflammation of the mucous membrane, but may arise from an acrid condition of the urine, from the administration of cantharides, turpentine, etc., and from the voluntary retention of urine for too long a time.

The treatment consists in the removal of the causes as far as possible and the hot bath. The inhalation of chloroform sometimes gives immediate relief; and several cases are recorded in which when the spasm occurred periodically it was cured by quinine. Inflammatory or congestive stricture commonly arises when a recent purulent discharge from the urethra has been checked by external cold or wet. The patient complains of heat, fullness, and soreness in the perinæum; the passage of the urine is extremely painful, the stream being small and ceasing before the bladder empties. The treatment is much the same as that for retention of the urine.

Strike. See Dip.

Strikes, a term applied to concerted movements on the part of workingmen to quit work unless their employers agree to some demand made by the men. The earliest strike of which there is a record in the United States occurred in Philadelphia in 1796, when 300 shoemakers struck for higher wages. The struggle was successful. In 1848 occurred a great strike of weavers at Fall River, and in 1877 occurred the first railroad strike. From 1888 to 1891 there were a great number of important strikes, including the street car strike of New York City. In 1892 there were six great strikes, including the one at Homestead, Pa., during which 10 men were killed, the militia was called out, and such destitution prevailed that the Government ordered an investigation. In 1892 there were two great railroad strikes. One of the most notable strikes in the history of the United States occurred in 1894 among the railroad employees of the roads centering at Chicago. Fully 100,000 men were affected. The strike originated among the 3,000 employees of the Pullman Car Company, who demanded higher wages. Just as their strike was about to fail, the cause of the strikers was espoused by the American Railway Union, an organization numbering over 100,000 railroad men. These men refused to handle Pullman cars, and a great tumult ensued. An immense amount of rioting followed, and the militia being unable to cope with the thousands of strikers, the President was obliged to call on the Federal troops to restore order, after first issuing two proclamations to the strikers. The railroads lost in property during this strike $700,000, and in earnings $5,000,000. Twelve persons were killed and nearly 700 arrested. Eugene V. Debs, the leader of the American Railway Union, was arrested for refusing to obey an injunction, and imprisoned for six months. The strike was a total failure. President Cleveland appointed a commission to investigate the strike, and this commission blamed the railroads for the trouble, and advised Congress to pass a law providing for compulsory arbitration of all labor troubles.

In more recent years State legislation against boycotting, blacklisting and conspiracy, and the ruling of courts against strikers and their methods, have done much to lessen these industrial disturbances. The strike of the steel workers in 1901 was to force a recognition of their union; there was no grievance on the scores of hours or wages.

The open warfare between capital and labor has been an extraordinarily destructive one, as the statistics of the Department of Labor show. During the 13½ years from January 1, 1881, to June 30, 1894, the open struggles cost more than $285,000,000. It threw 3,714,406 persons out of employment by reason of strikes, each striker losing an average of $44; and 366,690 by reason of lockouts, each person locked out losing an average of $73. But averages are unreal. They are based on short and long strikes together, and a more vivid impression of the unavailing struggle is given by their frequency. During this period there were in the United States 14,390 strikes in 69,167 establishments. That means that the fight was as widespread as it was mischievous. Chicago suffered most, as far, at least, as the number of establishments involved is concerned. The most vexed industries were the building trades, in which 26,860 establishments were involved; then the following in order: coal and coke, tobacco, clothing, food preparations, metals and metallic goods, transportation, stone quarrying and cutting, boots and shoes. The strikes succeeded in 44 per cent. of the establishments affected; and they failed in 44 per cent. In the rest it was a "drawn battle."

The following is a summary of the strikes and lockouts in the United States in 1881-1900:

Number of strikes, 22,793; establishments involved, 117,500; employés thrown out of employment, 6,105,694 (not including the number in 33 establishments for which these data were not obtainable): average duration (days), 23.8; wage loss of employés, $257,863,478; assistance to employés by labor organizations, $16,174,793; loss of employers, $132,731,121. The per cent. of establishments in which strikes succeeded was 50.77; succeeded partly, 13.04; failed, 36.19.

Number of lockouts, 1,005; establishments involved, 9,933; employés thrown out of employment, 504,307; average duration (days), 91.7; wage loss to employés, $48,819, 745; assistance to employés by labor organizations, $3,451,461; loss of employers, $19,927,983. Per cent. of establishments in which lockouts succeeded, 50.79; succeeded partly, 6.28; failed, 42.93.

The strike of the Pennsylvania anthracite coal miners in 1902, which was settled by arbitration after a cost of about $147,000,000, is the most notable one on record.

Strindberg, August, a Swedish author; born in Stockholm, Jan. 22, 1849; became successively schoolmaster, actor, physician, telegraph employee, civil servant, painter, preacher, private tutor and State librarian. The first book of his that made its mark was "The Red Room" (1879), a bitter satire on conventional (Swedish) society. This made its author enemies, and to their attacks he replied in another stinging satire, "The New Kingdom" (1882); but after its publication he had to go into voluntary banishment and lived abroad. Two years later he published a collection of short stories ("Married Life") and in 1885 a plea for the socialistic conception of society in "Utopias in the Real World." Two books descriptive of the life and manners of the inhabitants of the Stockholm skerries — "The People of Hemsö" (1887) and "Life of the Skerry Men" (1888) — are probably the best things he has written.

Stringham, Silas Horton, an American naval officer; born in Middletown, N. Y., Nov. 7, 1798; joined the navy in 1809; and served on the frigate "President" when that vessel engaged the "Little Belt" and later the "Belvidere." He was promoted lieutenant in December, 1814; served on the schooner "Spark" in the Mediterranean Sea in 1815-1818; and took part in the war with Algiers. In 1821-1824 he was executive officer on the "Hornet" in the West Indies, and took part in the capture of the "Moscow," the most dreaded piratical ship in that section. Promoted captain in 1841, he served on the "Ohio" during the bombardment of Vera Cruz in 1847. At the outbreak of the Civil War he was ordered to Washington to advise concerning war preparations. He strongly advocated the relief of Fort Sumter, but before his advice was followed the place was reduced. He was later given command of the North Atlantic Blockading Squadron, which bombarded and received the surrender of the forts at Hatteras Inlet. This was the first important naval victory of the war. In December, 1861, Stringham was promoted commodore and retired from active service owing to age; and in July, 1862, was promoted rear-admiral on the retired list. He died in Brooklyn, N. Y., Feb. 7, 1876.

Strix, in ornithology, a genus founded by Linnæus, containing all the owls known to him. See Owl.

Strobel, Edward Henry, an American educator; born in Charleston, S. C., Dec. 7, 1855; was graduated at Harvard University in 1877 and at its Law Department in 1882; and was admitted to the bar in 1883. He was secretary of the United States legation in Madrid, Spain, in 1885-1890; a special United States agent to Morocco in 1888 and 1899; Minister to Chile in 1894-1897; counsel for Chile before United States and Chilean Claims Commission in 1899; Professor of International Law at Harvard in 1898-1906; general adviser to the Siamese Government (on Harvard leave) and member of The Hague Permanent Arbitration Court from 1903. He died Jan. 15, 1908.

Strobilus, in botany, a catkin the carpels of which bear naked seeds.

Stromboli, one of the Lipari Islands; off the N. coast of Sicily; 12 miles in circuit. Its cone, 3,022 feet high, is one of the few volcanoes that are constantly active. At regular intervals showers of stones are ejected, and these almost all fall again within the crater. The ancients regarded Stromboli as the seat of Æolus, and in the Middle Ages it was held to be the entrance to purgatory. The island yields, besides sulphur and pumice-stone, cotton, fruits, and wine.

Strombus, in zoölogy, the stromb; the type genus of *Strombidæ*. Shell sub-ventricose, tubercular or spiny; spire short; aperture long, with a short canal above, truncated below; outer lip expanded, lobed above, and sinuated near the notch of the anterior canal. Woodward puts the species at 65, from the West Indies, Mediterranean, Red Sea, India, Mauritius, China, New Zealand, Pacific, and Western America. Found on reefs at low water, ranging to 10 fathoms.

Stromeyerine, or **Stromeyerite** (after Stromeyer, the discoverer of cadmium), an orthorhombic mineral, but occurring mostly massive; hardness, 2.5–3; sp. gr. 6.2–6.3; luster, metallic; color, dark steel-gray, tarnishing on exposure; streak shining; fracture, sub-conchoidal. Composition: Sulphur, 15.8; silver, 53.1; copper 31.1 = 100, corresponding to the formula $Ag_2S + CuS$. Occurs with copper pyrites at a few localities.

Strong, Augustus Hopkins, an American educator; born in Rochester, N. Y., Aug. 3, 1836; was graduated at Yale University in 1857; held pastorates in Haverhill, Mass., in 1861–1865, and Cleveland, O., in 1865–1872; and in the latter year became President and Professor of Systematic Theology in the Rochester Theological Seminary. He was the author of "Systematic Theology"; "Philosophy and Religion"; "The Great Poets and Their Theology"; and "Christ in Creation and Ethical Monism."

Strong, James, an American educator; born in New York city Aug. 14, 1822; was graduated at Wesleyan College in 1847; settled in Flushing, Long Island, and there built the Flushing railroad of which he became president. He later turned his at-

tention to literary work; was Professor of Biblical Literature at Troy University in 1858–1861; and became Professor of Exegetical Theology at Drew Theological Seminary in 1868. His publications include: "A New Harmony and Exposition of the Gospels" (1852); "Harmony in Greek" (1854); "Scriptural History Delineated from the Biblical Records and all other Accessible Sources" (1878); "Irenics, a Series of Essays showing the Virtual Agreement between Science and the Bible" (1883); and "The Tabernacle of Israel in the Desert" (1888). The principal work of his life was the "Cyclopædia of Biblical, Theological, and Ecclesiastical Literature" (10 vols. 1867–1881; 2 supplement vols. 1885–1887). He was associated with Dr. John McClintock on the first three volumes which were begun in 1853, and took full charge of the work on the death of his associate. He died in Round Lake, N. Y., Aug. 7, 1894.

Strong, Josiah, an American clergyman; born in Naperville, Ill., Jan. 19, 1847; settled with his parents in Hudson, O., in 1852; was graduated at the Western Reserve College in 1869 and received a theological training at Lane Theological Seminary; was ordained in the Congregational Church, and held pastorates in Wyoming and Ohio; was secretary of the Evangelical Alliance for the United States in 1886–1898. In the latter year he was made president of the League for Social Service. His publications include: "Our Country" (1885); "The New Era" (1893); "The Twentieth Century City" (1898); "Religious Movements for Social Betterment" (1900); and "Expansion" (1900).

Strong, Latham Cornell, an American author; born in Troy, N. Y., June 12, 1845. He was editorially connected with the Troy "Whig," and contributed verses to other journals and periodicals, besides a series of "Letters from Europe." His published volumes include: "Castle Windows" (1876); "Poke o' Moonshine" (1878); "Midsummer Dreams" (1879); and "Pots of Gold." He died in Tarrytown, N. Y., Dec. 17, 1879.

Strong, Nathan, an American Congregational clergyman; born in Coventry, Conn., Oct. 16, 1748. He was a chaplain in the Revolutionary army; projected and sustained the "Connecticut Evangelical Magazine" (1800–1815); founded and conducted the Connecticut Missionary Society (1798–1806); and compiled the "Hartford Collection of Hymns" (1799). His published works include two volumes of "Sermons" (1798–1800), and a pamphlet, "The Doctrine of Eternal Misery Consistent with the Infinite Benevolence of God" (1796). He died in Hartford, Conn., Dec. 25, 1816.

Strong, Theodore, an American mathematician; born in South Hadley, Mass., July 26, 1790; was graduated at Yale University in 1812; Professor of Natural Philosophy and Mathematics at Hamilton College in 1816–1827; and held a similar chair at Rutgers College in 1827–1861. In the realm of pure mathematics he was conceded to have no superior. After the ablest mathematicians of Europe had failed to solve the irreducible case of cubic equations left by Cardan, he discovered its solution by a direct method. He was also the discoverer of the method of extracting any root of any integral number by a direct process. His publications include "Notes on the Parallelogram of Forces and on Virtual Velocities" (1864); "On the Integration of Differential Equations of the First Order and Higher Degrees" (1864); "A New Theory of the First Principles of the Differential Calculus" (1865); "A Treatise on Elementary and Higher Algebra" (1869); "A Treatise on the Differential and Integral Calculus"; etc. He died in New Brunswick, N. J., Feb. 1, 1869.

Strongylidæ, in zoölogy, a family of *Nematoidea*. Body round, sometimes much elongated and filiform; mouth round, oval, or triangular, frequently very large, naked or armed with a horny pharyngeal armature; tail of male furnished with a bursa, usually emitting two spicules; in some the bursa is replaced by two divergent membranous lobes. Cobbold enumerates the following genera: *Strongylus, Eustrongylus, Selerostoma* (=*Syngamus*), *Dochmius, Prosthecoeaster, Stenurus, Diaphanocephalus, Stephanurus, Deletrocephalus,* and *Dicentrocephalus*.

Strongylus, a genus of nematoid worms belonging to the family *Strongylidæ,* of which this genus is the type. The *S. bronchialis* is a species infesting the bronchial tubes of man, the female attaining the length of an inch. The family characters of this group are a round thread-like body (hence the name), a round or oval mouth, and two terminal spicules provided for the male. The *S. bronchialis* is not of frequent occurrence as a human parasite. It was first discovered in 1790. Allied species (*S. paradoxus*) occur in the lungs of the pig, and (*S. micrurus*) in those of the calf. The *S. gigas* (otherwise known as *Eustrongylus gigas*) is notable as being the largest nematoid parasite found in man or other animals. In attains a length of over three feet (female), the male measuring one foot. Rare in man, *S. gigas* is found in almost all Carnivora.

Stronsay, one of the Orkney Islands, 12 miles N. E. of Kirkwall; about 7 miles long and 4½ miles broad. It is of moderate elevation, and its coasts are deeply indented. The soil is mostly good, and is now well cultivated.

Strontium (Sr=87.5), one of the metals of the alkaline earths, occupying an in-

termediate position as regards many of its properties to calcium and barium, the other members of the group. It is less abundant in nature than barium, and occurs as a constituent in the minerals strontianite and celestine, which are respectively the carbonate ($SrCO_3$) and sulphate ($SrSO_4$). In the metallic state it is usually white, heavy, oxidizable in air, and decomposing water at ordinary temperatures. The most important compound is strontia (SrO), from which Davy first obtained the metal in 1808 by electrolysis. It resembles baryta, forming a white soluble hydrate (SrO, H_2O), which is the compound formed when the metal decomposes water. Strontia is best prepared by decomposition of the nitrate by heat; while the nitrate ($Sr(NO_3)_2$) and chloride ($SrCl_2$) are easily obtained by treating the mineral carbonate with nitric and hydrochloric acid respectively. It also forms a dioxide (SrO_2), which is prepared as the corresponding barium compound is by exposing the monoxide to a strongly-heated current of oxygen. Strontium and its compounds burn with a very characteristic crimson flame, which gives a well-marked line or banded spectrum.

Strontium Bromide, $SrBr_2$; prepared by a solution of the carbonate in hydrobromic acid. It separates from its aqueous solution in long needles containing three molecules of water, is slightly soluble in alcohol, easily in water.

Strontium Chloride, $SrCl_2$; produced by heating anhydrous strontia in a stream of chlorine. It crystallizes from water in deliquescent needles or prisms, which dissolve easily in water, slightly in alcohol.

Strontium Hydrate, $SrH_2O_2 = Sr''O.H_2O$; a crystalline compound produced by the direct union of water with strontium oxide. It has a great attraction for carbonic acid.

Strontium Nitrate, $Sr(NO_3)_2$; prepared by dissolving the native carbonate in nitric acid, filtering the solution and evaporating till a pellicle begins to form on the surface. It crystallizes in anhydrous octahedrons; slightly soluble in cold, very soluble in boiling water. Chiefly used in the preparation of red fire.

Strontium Oxide, SrO; strontia; prepared by heating strontium nitrate to redness. It is a grayish-white; porous mass, having an alkaline taste and reaction; sp. gr. 3–4, infusible, and not volatile.

Strophanthus, a genus of plants belonging to the natural order *Apocynaceæ*, and natives of tropical Africa and Asia. The flowers are in terminal heads; the corolla is funnel-shaped, with its limb divided into five long cord-like segments (hence the name, Greek *stropohs*, "a twisted cord," *anthos*, "a flower"); the style is thread-like surmounted by a cylindrical stigma; and the fruit is a double follicle. Each follicle contains a large number of seeds having beautiful comose awns. There are several species, but the best known is the *S. hispidus*, variety *Kombé*, the seeds of which are now largely used in medicine. This species is widely distributed in tropical Africa, and climbs up the highest trees, hanging from one to the other in festoons. It has follicles 8 to 12 inches long, containing from about 100 to 200 seeds, each of which weighs about half a grain. An extract of the seeds is used as an arrow poison (Kombé or inee) in districts widely apart, as at Kombé, in the Manganja country, in the Zambesi district, in the Somali country, in the Gaboon district, in Guinea, and in Senegambia. Dr. Livingstone described it as used for killing animals only. The wounded animal is followed till the poison begins to take effect, it is then watched till it drops, the portion of meat round the wound is cut away and all the rest eaten.

In the British "Pharmacopœia" strophanthus is defined as the mature ripe seeds of *S. hispidus*, variety *Kombé*, freed from the awns. Each seed is about $\frac{3}{5}$ inch long, $\frac{1}{6}$ inch broad, oval in shape, and flattened at the sides. The seed coat is of a fawn color, and covered with silky hairs. The kernel is white and oily, with a very bitter taste. The seeds contain an active principle, *strophanthin*, which is extremely poisonous, the medicinal dose of it being $\frac{1}{120}$ to $\frac{1}{60}$ grain. The drug is usually administered in the form of the officinal tincture of strophanthus made from the seed, of which the dose is 2 to 10 minims. Its action and uses are very similar to those of digitalis.

Strophe, in the Greek drama, the turning of the chorus from the right to the left of the orchestra, the return being the antistrophe; the part of a choral ode sung during the act of so turning; hence, in ancient lyric poetry, a term for the former of two corresponding stanzas, the latter being the antistrophe. The term is sometimes used in relation to modern poetry. In botany, the spirals formed in the development of leaves.

Strophomena, in palæontology, a genus of *Orthidæ;* shell semicircular, widest at the hinge line; concave-convex radiately streaked; ventral valve with an angular notch. Known species, 129; from the Lower Silurian to the Carboniferous.

Strophulus, in pathology, the redgum, or tooth-rash; an eruption of minute hard, slightly-red pimples, clustered and scattered, affecting infants or young children. The largest number of pimples are on the face and the neck. It arises from irritation of the stomach, and has been supposed by some to be lichen modified by the delicate skin of the infant affected. The irritation is slight,

and the disease not dangerous. Unimportant variations have led to the establishment of the species *S. intertinctus, S. confertus, S. candidus,* and *S. volaticus.*

Strossmayer, Joseph Georg, a Croatian prelate; born in Essek, Slavonia, Feb. 4, 1815; studied in the Diakovo seminary, at the University of Budapest, and after taking priest's orders (1838) in the Vienna Augustinum. As bishop after 1849 of Diakovo (a diocese including Bosnia and Syrmia), he was the head of the Croatian party in the Vienna Reichsrath, and by his statesmanlike strivings for autonomy incurred the dislike of the imperial government. In Western Europe, however, he was chiefly known as one of the chief opponents of the Infallibility Dogma in the Vatican Council (1870), being one of the 88 who voted "No." His speeches there made Dupanloup own him his master in oratory, but their liberal sentiments respecting Protestantism called forth the cry of "Heretic!" After the promulgation of the decree he was left to his own beliefs, since his influence over his countrymen was rendered boundless by a princely liberality, of which an instance was his sending $5,000 to the Slavonic sufferers in the Russo-Turkish war. He died April 8, 1905.

Strother, David Hunter, pseudonym PORTE CRAYON; an American author; born in Martinsburg, Va., Sept. 16, 1816. He was a colonel of the Union army in the Civil War. His series of sketches contributed to "Harper's Magazine" in the years before the war, under the pen-name "Porte Crayon," illustrated by himself, were great popular favorites; they were republished in book form under the titles "The Blackwater Chronicle" (1853), and "Virginia Illustrated" (1857). He died in Charleston, W. Va., March 8, 1888.

Strozzi, the name of a wealthy and illustrious Florentine family. Palla, Filippo, and Piero were the three most renowned members of this princely house, between 1432 and 1537, and who were either exiled or lost their lives in the struggle for liberty against the power of the Medici family.

Struensee, Johann Friedrich, Count, a Danish statesman; born in Halle-on-the-Saale, Prussian Saxony, Aug. 5, 1737; studied medicine, and in 1768 was appointed physician to the King of Denmark. He soon became a favorite with both the king and queen, and effected the dismissal of all those who were obstacles to his own ambitious plans. In 1770 he advised the king (who was little better than an imbecile) to abolish the council of state, a measure which roused the indignation of the Danish nobility, since it threw all authority into the hands of the queen and the favorite. Struensee by various means gradually usurped the administration of all affairs in the name of the king, and caused himself to be created count. His arrogance now caused a conspiracy against him, and on Jan. 16, 1772, the queen, Struensee, and their partisans were seized. The favorite was brought before a special commission, was found guilty of criminal relations with the queen (on insufficient evidence), convicted, and executed on April 28, 1772.

Strut, a bar in a frame having equal and opposite forces applied to its ends, acting inward and producing upon it a state of compression. Specifically: (1) A diagonal timber which acts as a post or brace to support a principal rafter or purlin. Its lower end is stepped into a tie beam, or on a shoulder of a king or queen post. (2) A brace between joists.

Struthio, in ornithology, the ostrich; the typical genus of *Struthioninæ,* having only two toes, the third and fourth on each foot. Most authorities reckon but one species, *S. camelus;* but as the birds from the N. of Africa have the skin of the parts not covered with feathers flesh-colored, while this skin is bluish in birds from the S., the latter are sometimes placed in a separate species (*S. australis*). Birds from the Somalis country have also been described as forming a distinct species (*S. molybdophanes*), because the skin not covered with feathers is of a leaden hue.

Struthiolaria, in zoölogy, a genus of *Cerithiadæ,* with five species, from Australia and New Zealand, where sub-fossil specimens have been found. Shell turreted, whorls angular, aperture truncated in front, columella oblique; outer lip prominent in the middle, inner lip callous, expanded; operculus claw-shaped. Animal with cylindrical tentacles, eye-pedicels short, foot broad and short.

Struthionidæ, in ornithology, a family of *Ratitæ.* Bill short, robust, powerful, flattened, and having a nail-like process at the tip; nostrils longitudinal, basal; no hind toe present. There are two sub-families: *Struthioninæ* (with two genera, *Struthio* and *Rhea*) confined to Africa, and temperate South America, and *Casuarinæ* (sometimes made a family *Casuaridæ*) inhabiting Australia and the islands from Ceram to New Britain.

Strutt, John William. See RAYLEIGH, BARON.

Strutt, Joseph, an English antiquary; born in Springfield, England, Oct. 27, 1742; was articled to W. W. Ryland, the engraver, and obtained the gold and silver medals of the Royal Academy. In 1773 he published his "Regal and Ecclesiastical Antiquities from Edward the Confessor to Henry VIII." (new ed. 1842), and shortly afterward his "Horda Angel-Cynnan, or Manners, Customs, etc., of the English" (1774–1776, 3

vols. with 157 plates). His other works include a "Chronicle of England" (1777–1778); "Biographical Dictionary of Engravers" (1785–1786); "Dresses and Habits of the People of England, etc." (1796–1799, with 142 plates; new ed. 1875); and "Sports and Pastimes of the People of England" (40 plates, 1801; new ed. with 140 plates, 1827). He left some manuscripts, from which were afterward published his "Queenhoo-Hall," a romance, concluded by Sir Walter Scott; "Ancient Times," a drama; also "The Test of Guilt, or Traits of Ancient Superstition" a dramatic tale. He died in London Oct. 16, 1802.

Struve, Friedrich Georg Wilhelm, a German astronomer; born in Altona, Holstein, April 15, 1793. His whole life was devoted to astronomy in the service of the Russian government; from 1813 to 1820 observer and Professor Extraordinary of Astronomy in the University of Dorpat; from 1820 to 1838 Professor of Astronomy and director of the same observatory; and from 1839 to 1864 director of the new Imperial Observatory at Pulkova, near St. Petersburg. His great work in astronomy was the observation and publication of the great Dorpat catalogue of double-stars, generally known as the "Mensuræ Micrometricæ," and denoted by the letter Σ and the "Positiones Mediæ," or results of the meridian observations of the same stars, this catalogue being generally denoted by the letters Σ [PM]. These catalogues have served as the model for all similar work since. The rest of his life was given to the foundation and organization of the great observatory at Pulkova, the most important of the observatories of the world. He died Nov. 23, 1864.

Struve, Otto Wilhelm, son of Friedrich Georg Wilhelm; born in Dorpat, Russia, May 7, 1819; grew up in the Dorpat and Pulkova Observatories, and on the death of his father succeeded him as director of the great Pulkova Observatory near St. Petersburg. His work was given mostly to the observation of double stars, and to continuing the organization and administration of the great observatory founded by his father. He was the presiding officer of the International Astrophotographic Congress at Paris in 1877. In 1890 he resigned the directorship at Pulkova. Died in 1905.

Struvite (after the Russian statesman, Struve), an orthorhombic mineral occurring only in isolated crystals; hardness, 2.0; sp. gr. 1.65 to 1.7; color, yellowish to brown, becoming white on exposure, by loss of water of crystallization; luster, vitreous; translucent. Composition: Phosphoric acid, 29.0; magnesia, 16.3; ammonia, 10.6; water, 44.1 = 100, corresponding to the formula NH_4O, 2MgO, PO_5 + 12HO. Found originally in a bed of peat, above which a large amount of cattle dung existed; since found in guano at various localities.

Stry, or **Stryi,** a town of Austria, in Galicia; on a river of the same name; was the scene of a great conflagration in April, 1886, which destroyed over 600 houses and most of the public buildings. The chief manufactures are leather goods and matches.

Strychnine, in chemistry, formula, $C_{21}H_{22}N_2O_2$, strychnia, a highly poisonous alkaloid, discovered in 1818 by Pelletier and Caventou in St. Ignatius' beans, and shortly afterward in *Nux vomica* seeds. It is obtained, together with brucine, by boiling *Nux vomica* seeds in dilute sulphuric acid till they become soft, crushing the seeds, and adding to the expressed liquid an excess of calcium hydrate, which throws down the two alkaloids. On washing with cold alcohol, brucine is dissolved, leaving strychnine in an impure state. When pure, it crystallizes in colorless, tetragonal prisms, having a very bitter and somewhat metallic taste, is almost insoluble in water, absolute alcohol, and ether, but soluble in spirit of wine and chloroform. Strychnine was scarcely heard of as a means of poisoning before the year 1855, the date of the Rugeley murders in England, for which Palmer was tried at the Old Bailey in 1856, and executed. The symptoms are very marked, and comprise violent tetanic convulsions, laborious respiration, from the tightening of the chest muscles, spasmodic contraction of the heart, and rigidity of the spinal column. These are succeeded by a short calm, after which they are again repeated till death or progress toward recovery ensues, the time being about two hours after taking the poison. From 1½ to 2 grains and upward generally proves fatal, and the presence of the poison can be best recognized by the color test. When strychnine is brought under the influence of nascent oxygen, the former instantly acquires a rich blue color, successively passing into purple, violet, crimson, orange, and yellow.

Strychnos, in botany, the typical genus of *Strychneæ*. Calyx five-parted; corolla tubular, funnel-shaped, limb spreading; stamens five, inserted into the throat of the corolla; ovary two-celled; style one; stigma capitate; fruit, a berry with a hard rind and a pulpy sarcocarp; seeds many, peltate. Natives of Asia, America, and Australia. *S. Nux Vomica*, the snake wood, strychnin tree, or nux vomica tree, is a moderate-sized evergreen, with dark gray bark and no spines; the leaves entire, strongly three to five nerved; the flowers small, in corymbs, greenish-white; the fruit round, like an orange in color, but smaller, with a brittle rind, a white, gelatinous pulp, and many seeds. It is found on hills and in forests in India and Burma. The seeds, which are

about the size and shape of a 25-cent piece, constitute nux vomica and contain strychnine, and it is said, a brown dye. The wood is very bitter, especially the root, which has been given in intermittent fevers and as an antidote to the bites of venomous serpents. *S. potatorum*, a tree about 40 feet high, with only one seed, is the clearingnut tree of India; so called because the seeds render muddy water clear. They are used also in diseases of the eye. The fruit, which is like a black cherry, is eaten by the natives; the wood is used for carts, agricultural implements, and building. *S. toxifera*, the Guiana poison plant, is a climber, with a stem covered with long, spreading, red hairs, and five-nerved, acuminate leaves. It furnishes the chief ingredient of the poison called woorali, or oorali. *S. tieute*, from Java, has elliptical, acuminate, three-nerved, glabrous leaves, with simple tendrils opposite to them. It yields another deadly poison. *S. ligustrina* is said by Blume to furnish the genuine *Lignum colubrinum*. It is given in Java in paralysis of the lower extremities and as an anthelmintic. *S. pseudoquina*, a Brazilian tree about 12 feet high, has a corky bark (said to be equal to cinchona as a febrifuge), and short-stalked, ovate, quintuple-nerved leaves; all parts of it are intensely bitter except the fruit, which is eaten by children. The fruit of *S colubrina*, a large Indian climbing shrub, is esteemed by the Telegus as an antidote to the bite of the cobra. The fruit of *S. innocua* is eaten in Egypt.

Stryker, Melancthon Woolsey, an American educator; born in Vernon, N. Y., Jan. 7, 1851; was graduated at Hamilton College in 1872 and at the Auburn Theological Seminary in 1876. Subsequently he held pastorates in Auburn, N. Y.; Ithaca, N. Y.; Holyoke, Mass.; and Chicago, Ill.; and in 1892 became president of Hamilton College. He was the author of numerous hymns and poems including, "Song of Miriam"; "Lattermath"; "Letter of James"; etc.

Stryker, William Scudder, an American historian; born in Trenton, N. J., June 6, 1838; was graduated at Princeton College in 1858. During the Civil War he served on General Gillmore's staff and distinguished himself at the capture of Morris Island and in the assault on Fort Wagner. From 1867 till his death he was adjutant-general of New Jersey, and in 1874 was brevetted Major-General. He was admitted to the bar in 1866, but devoted much of his time to historical research, and published "Official Register of the Officers and Men of New Jersey in the Revolutionary War"; "The New Jersey Volunters"; "The Affair at Egg Harbor"; "The Battles of Trenton and Princeton"; etc. At the time of his death he was president of the New Jersey Historical Society. He died in Trenton, N. J., Oct. 29, 1900.

Strype, John, an English ecclesiastical historian; born in Stepney, England, Nov. 1, 1643; was educated at St. Paul's School, and Cambridge University, where he graduated B. A. in 1665. In 1669 he became vicar of Low Leyton, and remained there till within a few years of his death. He published nothing till after he was 50, and his works consist for the most part of transcriptions of curious and valuable papers, which he brought to light for the first time. The chief of them are "Memorials of Cranmer" (1694), followed by the "Lives of Sir Thomas Smith" (1698), "Bishop Aylmer" (1701), "Archbishop Parker" (1711), and "Archbishop Whitgift" (1718). His most important work was "Ecclesiastical Memorials" (3 vols. 1721). He died in Hackney Dec. 11, 1737.

Stuart Family, The. This house derives its name from the important office of steward of the royal household of Scotland. The name is often written Stewart, and occasionally Steuart. The form of Stuart was first assumed when Queen Mary went to France, and was adopted by all her descendants. The founder of the house seems to have been a Norman baron named ALAN, whose second son WALTER entered the service of David I. of Scotland, and became *dapifer* or steward of the royal household. Walter obtained large grants of land from David, and died in 1246. ALEXANDER, the fourth steward, had two sons: JAMES, who succeeded him in 1283, and JOHN, known in history as the Sir John Stewart of Bonkyl, who was killed at Falkirk (July 22, 1298). James was chosen one of the regents on the death of Alexander III., and died in the service of Bruce in 1309. His son, WALTER, the sixth steward, married Marjory, daughter of King Robert I., a union which secured to his family the crown of Scotland in the event of the extinction of the royal line. He died in 1326, and was succeeded by his son, ROBERT, the seventh steward, who, on the death of David II. without issue, succeeded to the crown as Robert II. in 1371.

Succeeding monarchs of this house, with dates of their accession, were, Robert III. (1390); James I. (1424); James II. (1437); James III. (1460); James IV. (1488); James V. (1513); Mary Stuart (1542); James VI. of Scotland (1568); and of England, James I. (1603); Charles I. (1625); Charles II. (1649); and James II. of England (1685).

Mary of Modena, second wife of James II. of England gave birth to James Edward Francis, Prince of Wales, commonly called the Old Pretender, or the Chevalier St. George. In 1715 an unsuccessful attempt was made by the Jacobites, or Stuart party,

to set this prince on the throne of his ancestors by force of arms. He married a granddaughter of John Sobieski, King of Poland, by whom he had two sons, Charles Edward, the Young Pretender, and Henry Benedict Maria Clement, who became a cardinal in 1747. The last male representative of the branch of the Stuart line descended from Henrietta Maria, daughter of Charles I., was Francis V., ex-Duke of Modena, who died childless Nov. 20, 1875. Many of the noble famlies of Scotland are descended from other branches of the Stuart line.

Stuart, Alexander Hugh Holmes, an American lawyer; born in Staunton, Va., April 2, 1807; was graduated at the Law Department of the University of Virginia in 1828, and began practice in Staunton; was a member of the Virginia Legislature in 1836–1839, and of Congress in 1841–1843. He was Secretary of the Interior under President Fillmore in 1850–1853; held a seat in the Virginia Senate in 1857–1861; and in the latter year he was a delegate to the Virginia Convention, where he opposed till the last the secession of the State. At the conclusion of the Civil War, he became a leader in the early reconstruction movement. He was elected to Congress in 1865, but was not seated. In 1868 he originated what became known as "the new movement" of the "committee of nine" by which Virginia was freed of military rule. In 1876–1882 and 1884–1886 he was rector of the University of Virginia. He died in Staunton, Va., Feb. 13, 1891.

Stuart, Arabella. See ARABELLA STUART.

Stuart, Charles Macaulay, a Scotch-American educator; born in Glasgow, Scotland, Aug. 20, 1853; was graduated at the Kalamazoo College in 1880; studied theology in the Garrett Biblical Institute; and was ordained in the Methodist Episcopal Church. He was assitant editor of the "Northwestern Christian Advocate" in 1886–1896. In the latter year he was made Professor of Sacred Rhetoric at the Garrett Biblical Institute. His publications include "Descriptive Text of Photogravures of the Holy Land" (1890); "Life and Selected Writings of Francis Dana Hemenway" (with A. W. Patten and C. F. Bradley, 1890); "Vision of Christ in the Poets" (1896); "Story of the Masterpieces" (1897); etc.

Stuart, Gilbert Charles, an American painter; born in Narragansett, R. I., Dec. 3, 1755. In his boyhood he went to Edinburgh with a Scotch painter named Alexander, with whom he studied his art; but his master dying, he worked his passage home, and began to paint portraits at Newport. In 1775 he made his way to London, where he led for two years a Bohemian life; but his talent was recognized by his countryman, Benjamin West, who took him into his family, and soon he became a fashionable portrait painter. In 1792, in the fullness of his powers and fame, he returned to the United States, and painted portraits of Washington, Jefferson, Madison, John Adams, and many of the distinguished men of the period, and was at work on a portrait of John Quincy Adams (afterward finished by Sully), when he died in Boston, July 27, 1828.

Stuart, James Ewell Brown, an American military officer; born in Patrick co., Va., in 1832; was graduated at the United States Military Academy in 1854; rose to 1st lieutenant the next year; distinguished himself in the campaign against the Indians in 1857, and became captain in 1860. In 1861 he resigned his commission in the United States army and entered the Confederate service. He was in charge of the Confederate cavalry at the first battle of Bull Run; and in the following September made a daring attack on the Federal forces at Lewinville, for which he was made a Brigadier-General. Soon after this he was promoted Major-General and subsequently was engaged in skirmishes and commanded troops at Chancellorsville and at Gettysburg. In 1864 he opposed Sheridan's cavalry, but was mortally wounded in a fight at Yellow Tavern. He died in Richmond, Va., May 11, 1864.

Stuart, John McDouall, an Australian explorer; born in Scotland in 1818. In 1844–1846 he accompanied Sturt's expedition, and in 1858 he successfully explored the country W. of Lake Torrens in South Australia. In 1862 he achieved the difficult task of crossing the Australian continent near the center from S. to N. He wrote "Explorations in Australia," edited and published in 1864 by W. Hardman, London. He died in London in 1866.

Stuart, Moses, an American theologian; born in Wilton, Conn., March 26, 1780; was educated at Yale College; and was called to the bar in 1802, but abandoned law for theology. In 1810 he was appointed Professor of Sacred Literature at the Andover Theological Seminary, a post he held for 38 years, during which time he published several Greek and Hebrew grammars, commentaries on some of St. Paul's Epistles and on the Apocalypse, "Hints on the Prophecies," "A Critical History and Defense of the Old Testament Canon," and many other works. He died in Andover, Mass., Jan. 4, 1852.

Stuart, Ruth McEnery, an American author; born in Avoyelles parish, La., in 1856. Her published writings include: "A Golden Wedding, and Other Tales"; "Carlotta's Intended, and Other Stories"; "The Story of Babette"; "Solomon Crow's Christmas Pockets"; "Pockets, and Other

Tales"; "Sonny"; "The Women's Exchange"; etc.

Stub Axle, a short axle attached on the end of a principal axle tree. It is variously made and secured. Sometimes it is a sort of jury axle, made as a temporary expedient when the arm of an axle has broken off. It occurs frequently on horse hayrakes and some other kinds of agricultural implements.

Stub, Ambrosius, a Danish lyric poet; born on the Island of Funen in May, 1705. His poems were all (except one) published after his death. He was the original of the hero of C. K. F. Molbeck's romantic drama "Ambrosius," and only great lyric poet of his time. He died in Ribe, Denmark, July 15, 1758.

Stubbes, John, an English author; born about 1541; was educated at Corpus Christi College, Cambridge, and Lincoln's Inn. He wrote an answer to Cardinal Allen's "Defense of the English Catholics," but is known by "The Discoverie of a Gaping Gulf, wherein England is like to be swallowed up by another French Marriage" (1579), against the marriage of Elizabeth with the Duke of Anjou. For his patriotism both himself and Page his printer, had their right hands struck off. He died about 1600.

Stubbes, Philip, an English author; wrote the "Anatomie of Abuses" (1583), "conteyning a Discoverie or Briefe Summarie of such Notable Vices and Imperfections as now rainge in many Christian countreyes of the World: but especialie in a very famous Ilande called Ailgna; Together with most fearful Examples of God's Judgmentes executed upon the wicked for the same as well in Ailgna of late, as in other places elsewhere." Wood tells us that he was "a most rigid Calvinist, a bitter enemy to popery, and a great corrector of the vices and abuses of his time; and though not in sacred orders, yet the books he wrote related to divinity and morality." A second part of his book appeared the same year (1583). In form it is a dialogue between Philoponus and Spudeus; the substance is a vehement denunciation of the luxury of the times, valuable in the highest degree to us for the light it throws on the dress and habits of the age of Shakespeare. Stubbes is, himself, really a bigoted and splenetic old fool, and he inveighs with curious passion against all extravagances of dress — "the great ruffs, puffed out doublets of the men; the curling, frizzling, and crisping of the hair of the women; their great ruffs and neckerchers of holland, lawne, camerick, and such cloth, lest they should fall down, smeared and smirched in the devil's liquor — starch." In his blindness he saps the very foundations of morality by pouring out his wrath alike on the mere extravagances of fashion and on breaches of the weightier matters of the law. The work was reprinted by Turnbull in 1836, and by Furnivall in the New Shakespeare Society's issues (1879–1882).

Stubbs, William, an English historian; was born in Knaresborough, England, June 21, 1825; was educated at Ripon Grammar School, whence he proceeded to Oxford University and latterly became a fellow of Trinity College. In 1848 he was ordained, and became vicar of Navestock, Essex, in 1850. In 1862 he was appointed librarian of Lambeth Palace, in 1866 Professor of Modern History at Oxford, in 1869 curator of the Bodleian Library, in 1875 rector of Cholderton, Wilts, in 1879 canon residentiary of St. Paul's, in 1884 bishop of Chester, and in 1888 bishop of Oxford. He edited many valuable historical works in the Rolls Series, including "Chronicles and Memorials of the reign of Richard I." (1864–1865); "Gesta Regis Henrici II." (1867); "Chronicle of Roger Hoveden" (1872–1873); "Memorials of St. Dunstan" (1874); and "Opera Radulphi de Diceto" (1876). His chief work is the Constitutional History of England (1874–1878). He published many other works besides the above, and was a member of various learned societies. He died April 22, 1901.

Stucco, a fine plaster used for coating walls. It is usually made of pure lime slaked and settled, mixed with clean sand. Stucco varies in quality and composition with the purpose for which it is intended. For internal decoration gypsum and pounded marble enter into its composition, as well as gelatine or glue in solution. Being mixed with water till it is of the proper consistency, it is applied to the cornices, moldings, etc. of rooms, and soon begins to set or harden, in which state it is molded, and is finished off with metal tools. For external work the stucco employed is of a coarser kind, and is variously prepared, the different sorts being generally distinguished by the name of cements. Some of these take a surface and polish almost equal to that of the finest marble. In bastard stucco a small portion of hair is employed. Rough stucco is merely floated and brushed with water, but the best kind is troweled. Also the third coat of plastering when prepared for painting, and a popular name for plaster of Paris or gypsum.

Stuckenberg, John Henry Wilburn, an American clergyman; born in Bramsche, Germany, Jan. 6, 1835; was graduated at Wittenberg College, Ohio, in 1857; studied philosophy and divinity in Germany; was ordained in the Lutheran Church; and held pastorates in Iowa and Pennsylvania. During the Civil War he was present, as chaplain of the 145th Pennsylvania Volunteers,

at the battles of Fredericksburg, Chancellorsville, and Gettysburg. He was professor in the Theological Department of Wittenberg College in 1873–1880, and pastor of the American Church in Berlin, Germany, in 1881–1894. His publications include, "History of the Augsburg Confession" (1868); "Christian Sociology" (1880); "The Final Science" (1885); "Introduction to the Study of Philosophy" (1888); "Tendencies in German Thought" (1896); "The Social Problem" (1897); "Introduction to the Study of Sociology" (1898); etc. He died May 28, 1903.

Stud Book, a book containing the pedigrees of famous animals, especially horses. That for English race-horses edited by the officials of the London Jockey Club, dates from 1808. There are stud books for Clydesdale horses, cattle, etc., and separate ones for collies, fox-terriers, St. Bernard dogs, etc.

Studding Sail, an additional sail spread by the aid of light booms beyond the leech of a square sail, in order to extend the area horizontally, in light winds. They may be added on both leeches of a square sail. The prolongation of the yard by which a studding sail is extended is a studding sail boom, which is supported by hoops on the yard called quarter-irons and yard arm irons.

Studerite, in mineralogy, a variety of tetrahedrite, containing over 5 per cent. of zinc. Found at Ausserberg, Wallis, Switzerland.

Studitae, an order of Greek monks, also known as the Acœmetae, or "Watchers," from the fact of their keeping up a perpetual service of chanting. The order originated in Constantinople in the 5th century. A prominent member, Studius, built a monastery called the Studium, whence their name.

Stuebelite (after Dr. A. Stübel), a massive mineral of reniform or botryoidal structure; hardness, 4–5; sp. gr., 2.223–2.263; luster, vitreous; color, velvet-black; streak, brown; fracture, conchoidal. An analysis yielded: Silica, 26.99; alumina, 5.37; sesquioxide of iron, 10.18; sesquioxide of manganese, 21.29; protoxide of copper, 15.25; manganese, 1.03; water, 16.85; chlorine, 0.77 = 98.33. Found in the island of Lipari.

Stuetzite, a monoclinic mineral found in crystals with gold and hessite, at Nagyag, Transylvania. Luster, metallic; color, lead-gray. Composition: Stelluride of silver, the proposed formula being Ag_4Te.

Stufa, a jet of steam issuing from a fissure in the earth; these jets are not uncommon in volcanic districts. The name is also applied to natural vapor baths, in which steam issues from the earth, generally accompanied by gas, and used for purative purposes.

Stuffing Box, in machinery, a box with an annular recess around a piston rod, and provided with a follower and bolts whereby the packing may be screwed down. Also, a sleeve adapted to press a collar or hemp around a piston rod; a gland. The stuffing boxes in a locomotive engine are recesses for admitting some soft material, such as white spun-yarn, to render steam tight, any rod working through this stuffing or packing. The piston rods, slide valve rods, regulator rods, and pump plunger, all work through stuffing boxes of this description.

Stuhlweissenburg, a town of Hungary; near the marshes of Sár-Rát, 42½ miles S. W. of Budapest. The chief buildings are the cathedral and the Church of St. Maria. built by Stephen I., the place of crowning and burial. Stuhlweissenburg was the residence of the Hungarian kings from 1027 to 1527, when Bela IV. removed to Ofen. The town manufactures cloth, flannel, cordovan, and knives, and has an important traffic in wool, corn, wine, and live stock. Stuhlweissenburg is believed to occupy the site of the Roman Floriana. It was held by the Turks at intervals from 1545 to 1688. Pop. (1900) 32,167.

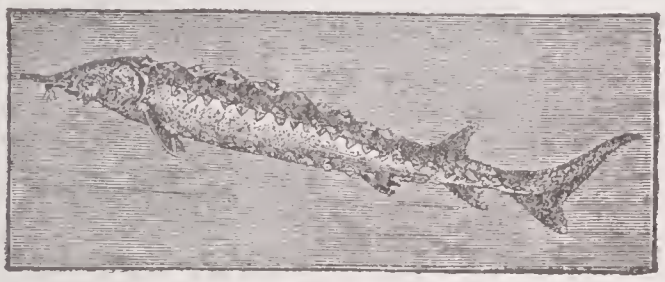
Stukeley, William, an English antiquary; born in Holbeach, Lincolnshire, Nov. 7, 1687, and from the grammar school there passed in 1703 to Corpus Christi College, Cambridge. Having studied medicine he practised successively at Boston, London, and Grantham; but in 1729 he took orders, and, after holding two Lincolnshire livings, in 1747 was presented to the rectory of St. George the Martyr in Queen Square, London. His 20 works, published between 1720 and 1726, and dealing with Stonehenge, Avebury, and antiquities generally, enshrine a good deal that is curious, and have preserved much that might have perished, but they are marred by a credulity and fancifulness which won for him the title of the "Arch-Druid." He died in London March 3, 1765.

Stump-tailed Lizard, in zoölogy, the *Trachydosaurus rugosus;* the body is long and stout, and head and tail are remarkably alike, so that, when the eyes are closed and the animal is motionless, it is a matter of difficulty to distinguish one from the other. The scales on the upper surface are large, rough, and broad, smaller beneath.

Stupor, numbness; deadness; extreme diminution or suspension of activity or sensibility; suppression or reduction of sense or feeling; as, the stupor of any physical organ. Intellectual torpor or insensibility; moral stagnation; mental stupidity; heedlessness or indifference to one's interests; as, stupor of the reasoning faculty.

Sturgeon (*Acipenser*), a genus of ganoid fishes of the family *Acipenseridæ* order

Chondrostei. The *Chondrostei* are ganoids without ganoid scales, the skin being either naked or with bony plates, as in the sturgeon. The skull is cartilaginous, but covered externally with bony plates belonging to the skin. The tail is asymmetrical or heterocercal, and the gelatinous notochord persists in the center of the vertebral column throughout life. Spiracles like those of sharks and skates are present in some genera. The distinguishing features of acipenser are these: the body is long and narrow, and the skin is provided with five longitudinal rows of bony shields, each bearing a projecting keel. One row of these bony plates is along each side of the body, one along the back, and one on each side of the ventral surface. The skin between these rows of plates is naked, but contains minute scales which give it a rough surface. The head projects into a flat, pointed snout, provided with fleshy tentacles or barbels; and on the under surface of this snout, some distance behind its extremity, is the mouth, which is without teeth, and capable of protrusion. The gill opening is wide. There are two pairs of fins, the pelvic being situated a long way back, close to the anus. There are two median fins, one



COMMON STURGEON.

dorsal and one ventral, both near the tail. The fin-rays are jointed and flexible. Spiracles are present behind the eyes. The air bladder communicates with the gullet.

There are many species of sturgeon, all confined to the Northern Hemisphere. They live in the sea and great lakes, and ascend the great rivers. All are of considerable size, and supply valuable commodities, for which they are regularly captured on a large scale. These commodities are their flesh, which is palatable and wholesome, their roe (caviare), and their air bladders, from which isinglass is made. The eggs are small and numerous, like those of bony fishes; there is no copulation, the ova being laid and fertilized on the bottom of the upper parts of rivers, like those of the salmon. The food of sturgeons consists of worms, crustacea, and mollusks, which they seek by routing in the sea bottom with their snouts.

The common sturgeon (*A. sturio*), is the only species which occurs in British seas and rivers. The specific characters distinguishing the species are minute, consisting in the number of the bony scales, position of the fins, length of the snout, etc. *A. sturio* is sometimes taken by trawlers at sea, more often in salmon stake nets, and in estuaries, especially in the Severn. It enters the rivers in the early part of the year for the purpose of breeding. When adult it is from 6 to 10 feet long. It occurs in the Mediterranean, Western and Northern Europe, and on the Atlantic coast of America, but is absent from the Black Sea and Danube, and from the Caspian Sea. In England as early as Edward II.'s reign, the sturgeon was a royal fish, belonging to the king when captured. The sterlet (*A. ruthenus*) is a much smaller species which is common in the Black and Caspian Seas and ascends the Danube as far as Vienna. It is one of the principal objects of the sturgeon fishery on the Volga. *A. huso* is the largest species, reaching 25 feet in length, and also belongs to the Black and Caspian Seas. *A. stellatus* is another species of these seas; it reaches 5 feet in length. Other species occur on the Atlantic and Arctic coasts of North America, in the great lakes of the St. Lawrence system, in California, and on the W. coasts of the North Pacific, in China, and Eastern Siberia. *A. brevirostris* belongs to the S. Atlantic coasts of the United States. The species of the great lakes of the St. Lawrence is *A. rubicundus*. The species of California and the Pacific coast is *A. transmontanus*.

The most important sturgeon fishery in Europe is that of the Volga and the Caspian Sea. The flesh of the fish is salted, and caviare and isinglass made on a large scale from the roes and air bladder. In the United States sturgeon flesh is eaten fresh and smoked and caviare is made both in Georgia and in San Francisco; but there is no great fishery in any particular district, and the manufacture of isinglass does not receive much attention.

Sturgis, Julian Russell, an English author; born in Boston, Mass., Oct. 21, 1848; was educated at Eton and Oxford, and wrote, "John-a-Dreams" (1878); "An Accomplished Gentleman" (1879); "Little Comedies" (1882); "Dick's Wanderings" (1882); "My Friends and I" (1884); "Thraldom" (1887); "A Master of Fortune"; "After Twenty Years"; "The Folly of Pen Harrington," etc. Died in 1904.

Sturgis, Russell, an American architect; born in Baltimore co., Md., was graduated at the College of the City of New York in 1856; studied architecture in Europe, and practised till 1880, when he went to Europe, to reside because of failing health. In 1885, however, he became active in writing and lecturing on art subjects and later edited the art sections in the "Century" and "International Dictionaries" and in "Johnson's Universal Cyclopædia," and

conducted the "Dictionary of Architecture" in 1901. He was the author of "Manual of Jarves Collection of Early Italian Pictures," "Classical Architecture on the Shores of the Mediterranean" and numerous monographs upon the work of American architects. He died Feb. 11, 1909.

Sturm, Johannes, a German educational reformer; born in Sleiden, Luxemburg, Oct. 1, 1507. In his 15th year he was sent to Liége, where he attended a school of the Brothers of the Common Life. Three years later Sturm continued his studies at Louvain, then the most enlightened center of the higher studies N. of the Alps, where shortly before there had been founded a college for the teaching of Latin, Greek, and Hebrew. Besides his zeal as an educational reformer Sturm all through life had the ambition to write a Latin style framed on the best models of antiquity. It was at this time, therefore, that he began the assiduous study of Cicero, whom to the end he never ceased to read with unabated zeal. He remained some five years in Louvain.

In 1529 he went to Paris, and at first gave himself to medicine, with a view to securing a settled competence. But his natural instinct again declared itself, and he returned to the study of Cicero, on whom he gave courses of lectures in the Collége Royal. Besides lecturing on Cicero he also taught dialectics, and had for one of his students Petrus Ramus. As a sympathizer with the new teaching in religion, identified as yet only with the name of Luther, it was at some risk that Sturm made his home in Paris. When a request was made to him (1536) by the authorities of Strassburg to come to their assistance in reorganizing the education of their town, Sturm accepted their offer. By its position on the frontiers of France and Germany Strassburg played a part of the highest importance in the political and religious history of the 16th century. Both in the religion and politics of his time Sturm took a prominent part, and on different occasions was sent on missions to France, England, and Denmark. In religion he took sides with Zwingli against Luther, with whose followers in Strassburg he was in constant controversy, which embittered all the later years of his life.

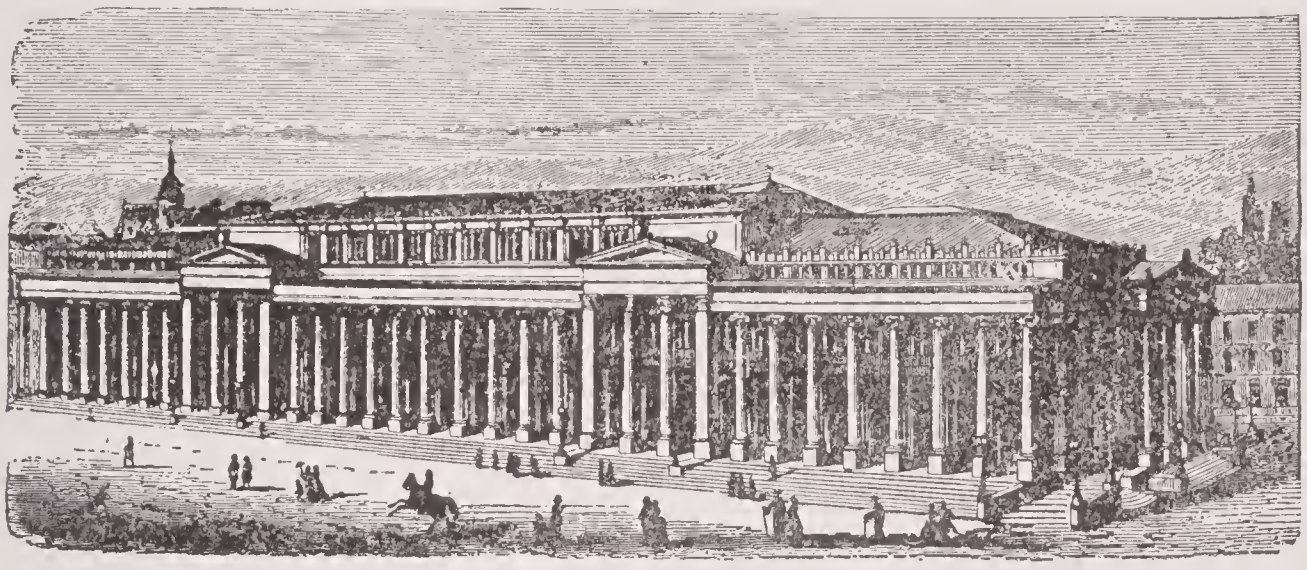
Before Sturm's settlement in Strassburg its magistrates had shown an enlightened interest in public instruction; but guided and inspired by Sturm the town became one of the most important educational centers in Europe. Two years after his arrival (1538) a new gymnasium was established, with Sturm as its rector, and at the same time boarding houses were erected for poor students with the object of suppressing the mediæval practice of mendicancy. Elementary and secondary education were thus provided for; but it was the ambition of Sturm that the higher studies should also be within reach of every youth of Strassburg. The divided councils of the town, however, and the outlay the organization of such studies would imply delayed Sturm's scheme till as late as 1564. In that year was founded the Strassburg Academy, which, together with the gymnasium, supplied a complete course of instruction in all the learning of the time. Sturm's ideal in education was "to direct the aspiration of the scholars toward God, to develop their intelligence, and to render them useful citizens by teaching them the skill to communicate their thoughts and sentiments with persuasive effect." In carrying out this ideal, described in his favorite phrase *pietas literata,* Sturm showed his superiority by his judicious gradation of the course of study, and by his novel and attractive methods of instruction. It is his chief praise that beyond all his contemporaries he succeeded in corelating public instruction to the moral and intellectual development of his time. He died in Strassburg March 3, 1589.

Sturm, Julius, a German lyric poet; born in Köstritz, Reuss, July 21, 1816. He wrote: "Two Roses; or, the Canticle of Love" (1854); "Devout Songs and Poems" (1858); "Israelite Songs" (3d ed. 1881); "Poems of Battle and Victory" (1870); "Mirror of the Time in Fables" (1872); "To the Lord my Song" (1884); "Palm and Crown" (1887); "In Joy and in Sorrow" (1896). He died in Köstritz, May 2, 1896.

Sturnidæ, in zoölogy, the Starling family, comprising insessorial birds distinguished from the family *Icteridæ* by having a rudimentary outer primary, thus making the primaries 10 instead of 9. The genus *Sturnus* comprises the common starling, *S. vulgaris,* of Europe, which is about the size of a thrush, black, with violet and green reflections, and spotted with white or fawn-color. It moves in large flocks, is easily tamed, and may be taught to sing, and even to speak.

Sturnus, in ornithology, the typical genus of *Sturninæ,* with six species, ranging over the Palæarctic region to India and South China in the winter. Bill as long as head, almost straight, blunt at tip; nostrils basal, supernal, partly overlaid by an operculum; gape angular, free from bristles; feathers of head and anterior part of body pointed and elongated; wings long, pointed; tail short, rectrices diverging at tip; tarsus scutellate in front, covered at side by an undivided plate, forming a sharp ridge behind; claws short and moderately curved. *S. vulgaris* is the starling.

Sturt, Charles, an Australian explorer; born in England; entered the army; and in 1825 was stationed at Sydney, New South Wales, with the rank of captain. In 1828 he led an expedition to explore the interior of Australia, and discovered the Macquarie, Castlereagh, and Darling rivers. He also explored the Murrumbidgee, and in 1830 discovered the Murray. In 1844 he penetrated to the great barren region nearly in the center of the continent. Subsequently he was made colonial secretary of South Australia, and the exposure to which he was subjected having undermined his health, he received a pension from the colony. He returned to England totally blind. He wrote "Two Expeditions into the Interior of South Australia in 1828–1831" (London, 1833), and "Narrative of an Expedition into Central Australia in 1844–1846" (London, 1849). He died in Cheltenham, England, June 16, 1869.



STUTTGART: THE KÖNIGSBAU.

Stuttgart, capital of the Kingdom of Würtemberg, Southern Germany, beautifully situated near the left bank of the Neckar, and closely surrounded by vineyard slopes, 816 feet above the sea. With the exception of part of the lower and older town, it consists of spacious streets and squares lined with fine buildings, among the latter being the new palace, finished in 1807; the old palace (1570); the Stiftskirche, a Gothic structure of the 15th century; the Gothic hospital church, containing a statue of our Saviour by Dannecker; and several other churches; the royal library (400,000 vols.); the museum and picture gallery; the polytechnic school; a great building containing the exchange and concert rooms, etc.; the theater, the town hall, and many other buildings. There are several high-class educational establishments, the polytechnic being the chief. Stuttgart is the chief center in South Germany for the book trade, connected with which are paper mills, type foundries, printing presses, and lithographic establishments. The other leading manufactures include dyes, chemicals, woolen and cotton goods, various fancy articles, jewelry, musical instruments, mathematical and scientific instruments, liquors, confectionery, and beer. Stuttgart dates from 1229, and in 1320 became the residence of the counts of Würtemberg. From 1436 to 1482 it was much improved and enlarged, and has since, with only a short interval, been the capital. E. from Stuttgart, and almost connected with it by the royal palace grounds, is the town of Cannstatt. Pop. (1905) 249,443.

Stuyvesant, Peter, a Dutch military governor; born in Holland in 1602; served in the West Indies, was director of the Dutch colony of Curaçoa, and lost a leg in an attack on the Spanish island of St. Martin. In 1647 he was made director-general of the New Netherlands, and reached New Amsterdam (now New York), in May of that year. Under his direction boundary lines were established between the Dutch and English possessions in America; but the British encroachments persisted till in August, 1664, an English fleet appeared in the bay and compelled the surrender of New Amsterdam, after which its name was changed to New York. Stuyvesant went to Holland in 1665, but afterward returned and spent the remainder of his life on his farm, called the *Bomerij*, from which the name Bowery was given to a well-known thoroughfare in New York city. He died in August, 1682.

Stye, a little boil on the margin of the eyelid, which commences in the follicle of one eyelash. Styes are most common in young people, especially in anæmic girls, and are mostly associated with some obvious derangement of the general health, which should be made the subject of treatment. The tumor generally bursts in a few days, and it is very seldom necessary to

puncture it. Warm-water dressings with lint and oiled silk should be applied.

Stygogenes, in ichthyology, a genus of *Hypostomatina*. the *prenadillas* of the natives. They are small siluroids, abundant in the lakes and torrents of the Andes, and have attracted considerable attention from the fact that Humboldt adopted the popular belief that they live in subterranean waters within the bowels of the active volcanoes in the Andes, and are ejected with streams of mud and water during eruptions, though he considered it singular that they were not cooked when vomited forth from craters or other openings. The explanation of their appearance during volcanic eruptions is that they are killed by the sulphuretted gases escaping during an eruption, and swept down by the torrents of water issuing from the volcano.

Stylasteridæ, in zoölogy, a family of *Hydrocorallinæ*, with several genera, living principally at considerable depths in the warmer seas. The skeleton is a branched calcareous structure, with cup-like depressions, each with a central chamber, surrounded by secondary chambers, separated from each other by short partitions. The colony consists of two sets of zooids, the perfect ones inhabiting the central chambers, while the smaller ones are occupied by imperfect zooids, resembling tentacles in appearance. The cavities of the zooids communicate by canals in the skeleton, and the reproductive organs are in the form of fixed sporosacs, developed within sac-like cavities in the skeleton. One fossil genus, *Distichopora*, from the Tertiary of France.

Style, a piece of iron or other material pointed at one end, used by the ancients for writing by scratching on wax tablets. The other end was made blunt and smooth, and was used to make erasures. Hence, a hard point for tracing, in manifold writing. A pointed tool used in graving. Also, the manner of writing with regard to language; the peculiar manner in which a person expresses his ideas or conceptions; the particular mode or form of expressing ideas in language which distinguishes one writer or speaker from another; the distinctive manner of writing characteristic of each author, or of each body of authors, allied as belonging to the same school, country, or epoch.

Also mode of presentation, especially in music or any of the fine arts; characteristic or peculiar mode of developing an idea or accomplishing a result; the peculiar manner in which an artist expresses his ideas; it is exhibited in his choice of forms and mode of treating them, and is determined in different ways, according to the changes of thought at different times and stages of its development. Besides the individual style, there is also a national style; as, the Egyptian, the Grecian styles of architecture. Each of the various branches of art has its peculiar style; as, the epic, lyric, and dramatic styles of poetry; the historical and the landscape styles of painting, etc. In architecture, a particular character as to the general artistic idea prevailing a building; as, the Gothic or Norman styles.

In botany, the part of a pistil intermediate in position between the germen or ovary below and the stigma above. It is considered to be an elongation of the ovary, and morphologically the upper narrow part of a carpellary leaf supporting the stigma. It is not more essential to a pistil than a petiole is to a leaf, and in fact is often absent. It may be taper or thick, is generally terete, but may be angular, or thin, flat, and colored. Sometimes it is continuous with, and at others articulated with the ovary; as a rule it arises from the apex, but occasionally from the sides of the latter. Its surface is generally smooth, but in *Compositæ*, most *Campanulaceæ*, etc., it is densely covered with hairs called collectors, which in *Lobeleæ* become an indusium. Sometimes styles so completely cohere that they look like one style with a plurality of stigmas. In fully describing the styles of a plant mention should be made of their number, length, figure, surface, direction, and proportion.

Style, in chronology, the method of reckoning time with reference to the Julian and Gregorian calendars, Old Style being founded on the former and New Style on the latter. The Julian Calendar prevailed in Europe to A. D. 1582. Pope Gregory XIII. published the Gregorian Calendar, enacting that 10 days should be deducted from the year 1582 by calling the day which by the Julian Calendar would have been Oct. 5, Oct. 15, 1582. The alteration took place that same day in Spain, Portugal, and part of Italy. In France and Lorraine the change was made on Dec. 10 [20]; in Holland, Brabant, Flanders, Artois, and Hainault on Dec. 15 [25] of the same year. In Switzerland the Roman Catholics adopted the new style in 1583 or 1584, as did those of Germany in 1584. The Danes did so in 1582, the Poles in 1586, the Hungarians in 1587, the German Protestant city of Marburg in February, 1682, the States of Utrecht on Dec. 1 [12], 1700, the other German Protestants about the same date. Till 1751 both the Julian, or Old Style, and the practise of commencing the legal year on March 25, subsisted in England. But by an act of George II., it was enacted:

(1) That throughout all His Majesty's dominions in Europe, Asia, Africa, and America the supputation according to which the year of our Lord began on March 25, shall not be used after the last day of December, 1751, and that the first day of January next following shall be

reckoned as the first day of the year 1752, and so on in all future years.

(2) That . . . . the natural day next immediately following September 2, 1752, shall be called and reckoned as the fourteenth day of September, omitting the eleven intermediate nominal days.

(3) That the several years of our Lord 1800, 1900, 2100, 2200, 2300 . . . . shall not be deemed bissextile or leap years . . . . and that the years of our Lord 2000, 2400, 2800 . . . . shall for the future be esteemed bissextile or leap years.

The difference between the Old and New Styles was progressive. Up to 1699 it was only 10 days, after 1700 it was 11 and after 1800 12 days. The year 1751 had no January, February, March 1–24, and September had only 19 days.

Stylidiaceæ, in botany, the styleworts; an order of epigynous exogens, alliance Campanales. Herbs or under-shrubs; the hairs, if present, sometimes glandular; leaves scattered, sometimes whorled, exstipulate, entire, their margins naked or ciliated. Pedicels of the flowers generally with three bracts; calyx superior, with two to six divisions, two-lipped or regular, persistent; corolla monopetalous, its limb generally irregular, with five to six divisions. Stamens two, filaments connate with the style into a longitudinal column; ovary with two, rarely with one cell, many-seeded. Fruit capsular. Swamp plants, chiefly from Australia. Known genera 5, species 121.

Stylite, one of a class of anchorites in the early Church who took up their abode on lofty pillars, where the limited space obliged them to stand continually, protected only at the sides by latticework or railing, and exposed to the open sky. Their position was an attempt to realize the two fundamental ideas of Christian asceticism — separation from the things of earth, and aspiration after those of heaven. The first Stylite was Simeon, the Syrian (A. D. 390–459), who commenced this mode of life near Antioch, about A. D. 420, on a pillar six or seven cubits, the height of which was repeatedly increased, till at last it was 36 feet high. His life was one of great austerity. After his death the Stylites became numerous, and peculiar privileges were accorded to them. This method of penance was confined to the East; Gregory of Tours mentions one Stylite in the district of Treves, but adds that the Gallic bishop caused his pillar to be destroyed.

Stylobate, in architecture, the substructure of a Greek temple below the columns, sometimes formed of three steps which were continued round the peristyle, and sometimes of walls raised to a considerable height, in which case it was approached by a flight of steps at one end.

Stylonychia, in zoölogy, a genus of *Oxytrichidæ,* with four species, living in salt, fresh, and stagnant water. Animalcules free-swimming, persistent in shape, encuirassed, ovate or elliptical, with hooks and setæ at the margin of the styles.

Stylophorus, in ichthyology, a genus of *Trachypteridæ,* with a single species, *S. chordatus,* of which only one example is known. Length about 11 inches; ventrals absent; tail terminating in a very long, cord-like appendage. It was obtained between Cuba and Martinique, and has been transferred from the museum of the Royal College of Surgeons, London, to the British Museum, South Kensington.

Stylopidæ, in entomology, an aberrant family of *Coleoptera,* parasitic on hymenopterous insects. The females are viviparous, apterous, and larviform, living permanently in the bodies of their hosts; the males are winged and active, and live but a few hours, solely to propagate their kind. The mouth organs of the latter are rudimentary; head short and broad, with curiously-forked antennæ; wings membranous and much expanded; the elytra do not serve as wing covers, but are reduced to slender appendages which, in dried specimens become twisted, whence the name of the order in which they are sometimes placed. The females are very prolific, each hatching within her body many thousands of eggs, and the larvæ escape from a hole in a part of the parent projecting from the abdomen of the host. The family is widely distributed, and contains three genera: *Stylops, Xenos,* and *Helechthrus.*

Stylosanthus, a genus of plants, order *Fabaceæ.* The pencil flower, *S. elatior,* found in dry, gravelly woods, from Long Island to Florida, has a stem mostly branched, one foot in height, remarkable for being densely pubescent on that side only which is opposite the insertion of each leaf, while the other side is smooth; bracts fringed with yellow bristles; flowers yellow.

Styphelia, in botany, the typical genus of *Styphelieæ.* Beautiful Australian and Tasmanian shrubs, with scattered, oblong or lanceolate leaves, and drooping red or green flowers. Some are cultivated in greenhouses. *S. adscendens,* a small prostrate shrub, has a cranberry-like fruit which is sometimes eaten.

Styptic, a remedy that has the virtue of clotting blood, or of closing the aperture of a wounded vessel. Oak bark decoction, gall nuts in powder or infusion, matico, and turpentine, are stypties derived from the vegetable kingdom; and from the mineral are derived salts of iron, the sulphates of copper and zinc, the acetate of lead and the nitrate of silver.

Styracaceæ, an order of plants, alliance Rhamnales. Monopetalous flowers, epipetalous stamens, a part at least of the

ovules suspended, a long radicle, and leafy cotyledons. There are 12 genera, and about 120 species, composed of trees or shrubs, which are sparingly distributed in warm and tropical regions. They are principally remarkable for yielding stimulant balsamic resins.

Styrax, in botany, the storax; the typical genus of *Styracaccæ*. Calyx campanulate, five-toothed, persistent; corolla monopetalous, deeply three to seven cleft; stamens 10, united at the base; anthers linear, two-celled; style simple; stigma three-lobed; ovary superior; ovules indefinite; fruit a drupe. Elegant trees and shrubs, mostly with stellate hairs, entire leaves, and racemes of white or cream-colored flowers. Found in the warmer parts of America and Asia; one is European and one African. *S. officinale*, a tree from 15 to 20 feet high, has ovate leaves, shining above, downy beneath, longer than the racemes, which are simple, and consist of five or six flowers. It is a native of Syria, Greece, and Italy. It furnishes storax, which exudes and hardens in the air when the bark is wounded. *S. benzoin* is the benjamin storax, or gum-benjamin tree. It has ovate, oblong, pointed leaves, glabrous above, downy beneath, only a trifle longer than the racemes, which are compound. It is found in Sumatra, Java, and the Malay Archipelago generally, and produces benzoin. *S. reticulata*, *S. ferruginea*, and *S. aurea* yield a gum used as incense. Among other American species are *S. grandiflorus*, *S. lævigatus*, and *S. pulverulentus*, *S. serratulum*, and *S. virgatum*, small trees, natives of Bengal, yield gum, but of inferior quality.

Styria, a duchy of Austria, bounded by Upper and Lower Austria, Hungary, Croatia, Carniola, Carinthia, and Salzburg; area, 8,670 square miles; pop. 1,356,494. The whole duchy, with the exception of the S. part, is mountainous. The Noric Alps traverse the district between the Enns and the Mur; the Styrian Alps between the Mur and the Drave; and the Carnic Alps between the Drave and the Save. These mountains rise to the height of between 7,000 and 8,000 feet, and are rich in minerals. Styria belongs to the basin of the Danube, which drains it by means of the four rivers mentioned above. On the S. plains and in the valleys the land is fertile, and wheat, maize, hemp, flax, and the poppy are raised. The vine thrives well in many districts. The chief sources of wealth are the forests and minerals, dairy farming, mining, and manufactures. Gratz is the capital.

Styrylamine, in chemistry, cinnylamine; formula, $C_9H_{11}N = \left.\begin{matrix} C_9H_9 \\ H_2 \end{matrix}\right\} N$, a base produced by subjecting to heat to 100°, in a sealed tube, a mixture of styrylic chloride, ammonia, and absolute alcohol. It forms small, colorless crystals, which readily melt to a yellowish oil, is slightly soluble in water, very soluble in ether.

Styrylic Chloride, a light yellow oil, obtained by passing dry hydrochloric acid gas into crystallized styrylic alcohol, heating the product to 100°, and washing with dilute soda-lye. It smells of anise oil, remains liquid at — 19°, and cannot be distilled, even in vacuum, without decomposition. Formula, C_9H_9Cl.

Styrylic Oxide, a light yellow, viscid oil, produced by the action of boric anhydride on styrylic alcohol. It has the odor of cinnamon, is heavier than water, and is partly decomposed by distillation. Formula, $(C_9H_9)_2O$.

Styryline, in chemistry, Chiozza's name for a base which he obtained by treating metastyrol with ammonium sulphide. Formula, C_9H_9N.

Styx, in mythology, one of the rivers of Hades — the 10th part of the waters of Oceanus — flowing round it seven times with dark and sluggish stream, across which Charon ferries the shades of the departed. The nymph of this stream was the daughter of Oceanus and Tethys, and she first, together with her children, came to the help of Zeus against the Titans. For this service they were taken to Olympus, and she herself became the goddess by whom the most solemn oaths of the immortals were sworn. When such an oath was taken Iris brought some of her sacred water in a golden cup, and whoever swore falsely by it lay speechless and breathless for a year, and was banished nine years from the councils of the gods. A rocky stream falling into the Crathis in the N. E. of Arcadia bore this name, the scenery around it being fittingly weird and desolate.

Suabia, an ancient German duchy. After bearing the name of Alemannia, from its original inhabitants the Alemanni, changed it to Suevia or Schwabenland, in consequence of the incursion of the Suevi. On the division of the kingdom of the Franks in 843, Suabia, along with Bavaria, became as it were the nucleus of Germany, and its rulers continued for many centuries to hold a prominent place in its history. In 1376 was formed, chiefly by the union of its towns, the celebrated Suabian League. From 1512 to 1806 Suabia formed one of the 10 circles into which the German empire was divided. It is now divided between Würtemberg, Baden, Bavaria, Hohenzollern, and Lichtenstein. The name of Suabia is also given to a division of Bavaria. Augsburg is its capital.

Suæda, in botany, the sea blite; a genus of *Chenopodiaccæ*. Saline herbs or shrubs with semi-cylindrical leaves; flowers generally perfect, with two bracts at the base;

calyx five-partite, without appendages or a wing at the back, often fleshy. Stamens five; style none; stigmas usually three; utricle inclosed in the calyx. Seed lentieular, crustaceous. Known species about 33; from salt marshes and seashores. Two are common in the temperate regions of Europe, *S. maritima*, the annual and *S. fruticosa*, the shrubby sea-blite; the first has two and the second has three styles. The first is an annual with the flowers generally solitary; it is smaller than the other species, and more common on the English seashores. *S. fruticosa*, *S. indica*, and *S. nudiflora* are found on the shores of India; their ashes furnish alkali.

Suaheli, a name given to the inhabitants of the Zanzibar coast of East Africa and the adjacent islands, a people of mixed Arabic and native African origin. They form the most important part of the subjects of the Sultan of Zanzibar, and their language is the common medium of communication in East Africa.

Suakin, a seaport of the Red Sea, stands on a small rocky island in a bay on its W. side, and is the principal outlet for the commerce of Nubia and of the countries of the Sudan beyond. The island town is connected with the settlement of El-Keff on the adjacent mainland by a causeway. There are active industries in silver ornaments, knives and spear heads, and leather work; but the commerce was, previous to the disturbances which broke out in that quarter in 1883, of much greater moment, being valued at $5,000,000 annually. Since tranquillity was restored the trade has revived. The more important exports are silver ornaments, ivory, gums, millet, cattle, hides, and gold; the imports, durra, cottons, flour, sugar, rice, ghi, dates, and coal. Here some 6,000 or 7,000 pilgrims embark every year for Mecca. The Egyptians occupied this port when they extended their power over the Sudan; and in its vicinity several battles were fought between the allied Egyptians and English against the fanatical followers of the Mahdi. Ever since those troubles began Suakin has been held by an English garrison. Pop. (1897) 15,713.

Sualocin and Rotanev, the names in Piazzi's catalogue to the stars Alpha and Beta Delphini, two of the brightest in the constellation of the Dolphin. Spelled backward they give the name Nicolaus Venator, the Latin form of Niccolo Cacciators, who was Piazzi's assistant, and who had charge of the publication of the catalogue. They have been the source of considerable annoyance to astronomers in trying to account for the origin of the names.

Suarez, Francis, a Spanish theologian; born in Granada, Spain, in 1548; he was one of the most eminent scholastic and polemical writers of the Roman Catholic Church. He entered the Society of Jesuits in 1564, and soon became professor in succession at Valladolid, Rome, Alcalá, and Salamanca. In 1597 Philip II appointed him principal Professor of Divinity at the University of Coïmbra, a position he held till his death. The most recent edition of his works, in 28 volumes, was completed in Paris in 1860. He died in Lisbon, Spain, in 1617.

Subaerial Denudation, in geology, denudation produced by the action of the air on rocks exposed to its influence, as opposed to submarine denudation. When the sun heats rocks, the component minerals expand to a different extent, and afterward, as they cool, contract differently. The alternations of heat and cold make rocks brittle; ice tends to split them; the carbondioxide of the air helps to decompose and weather them; the sand blast of the desert or of the sand dunes scrubs them. The aggregate effect of these causes, continued through many ages, is very great. Mr. Croll, in 1867 and 1868, and Mr. Geikie, in the latter year, estimated the whole amount of subaerial denudation over the hydrographical basin of the Mississippi at a foot in 6,000 years.

Subahdar, under the Mogul government, the title of a governor of a province. It now designates a native officer in the army in India, holding a rank equivalent to that of captain, but subordinate to the European officers.

Subapennine Beds, or **Series,** in geology, older Pliocene beds constituting a range of low hills flanking both sides of the Apennine chain. They are about 3,000 feet thick, becoming more massive toward the S. They exhibit a finer development of the Pliocene than any other in Europe, and constitute its typical series. There are innumerable alternations of light-brown or gray calcareous and argillaceous marls. They are chiefly marine, but fluviatile or lacustrine strata also occur. There are many plants of the genera *Pinus, Taxodium, Sequoia, Ilex, Quercus, Platanus, Prunus, Alnus, Ulmus, Ficus, Laurus, Cassia, Juglans, Acer, Betula, Rhamnus, Smilax*, etc. The upper portion contains the mammalian remains of *Mastodon arvernensis, Elephas meridionalis, Hippopotamus major*, with species of the genera *Ursus, Hyæna, Felis*, etc.

Sub=contrary, in geometry, applied to two similar triangles when they are so placed as to have a common angle at the vertex and yet their bases not parallel. In such triangles the angles at the bases are equal, but on the contrary sides. In logic, a term applied to each of two particular propositions when one is affirmative and the other negative. Thus, "Some man is learned," "Some man is not learned," are sub-contrary propositions with respect to each other. Sub-contrary propositions can-

not be both false, for then their contradictories, which are contrary propositions with regard to each other (in this case, "No man is learned," "All men are learned") would both be true. But, as in the examples given above, two sub-contraries may both be true. Also applied to the relation between two attributes which coexist in the same substance, but in such a way that as one increases the other decreases.

Sub-deacon, the lowest step in holy orders in the Roman Catholic Church, the highest of the minor orders among the Greeks. In the Roman Catholic Church sub-deacons prepare the sacred vessels and the bread and wine for mass, pour the water into the chalice at the offertory, and sing the Epistle; in the Greek Church they prepare the sacred vessels, and guard the gates of the sanctuary. There are no sub-deacons in the Anglican Communion.

Sub-elaphine, in zoölogy, resembling the red deer (*Cervus elaphus*), especially in the formation of the antlers. The elaphine type of antler has the brow tyne reduplicated, while the royal is developed at the expense of the tres, and much divided up in well-grown animals. In sub-elaphine deer (the genera *Pseudaxis* and *Dama*) the relative proportion of the tynes is much the same, but the brow tyne is quite simple.

Suberamic Acid, $C_8H_{12}O_2(HO)H_2N$; produced by the dry distillation of ammonium suberate. It is fusible, soluble in boiling water, and deposited therefrom on cooling.

Suberanilic Acid, $C_8H_{12}O_2(HO)C_6H_5HN$; produced by melting suberic acid with an equal volume of aniline, and recovered from the alcoholic filtrate obtained, after the separation of suberanilide. It crystallizes in microscopic laminæ, melts at 128°, is slightly soluble in boiling alcohol. It dissolves easily in ether, and when fused with potash yields aniline.

Suberanilide, in chemistry, $C_8H_{12}O_2(C_6H_5)_2H_2N_2$; produced along with suberanilic acid when suberic acid is melted with an equal volume of dry aniline. The product is dissolved in alcohol, from which the suberanilide crystallizes out in pearly laminæ. It melts at 183°, and dissolves readily in boiling alcohol and in ether.

Suberic Acid, a fatty acid originally found among the products of the oxidation of cork by nitric acid; hence its name, from *suber*, cork. It is contained in this substance in but small proportions, and is most readily obtained by the oxidation of the fats, more especially those of the stearic series. It forms a crystalline white powder destitute of odor, but having a slight acrid taste. It is soluble in 100 parts of cold and in 2 parts of boiling water. It is also soluble in alcohol and ether. Heated to 257° F., it melts, and runs up the sides of the vessel in which it is treated. The suberates of the alkalies and earths are soluble and crystallizable, and form white precipitates with the salts of the metal. Formula, $C_{16}H_{14}O_8$.

Suberic Ether, $C_8H_{12}O_2(C_2H_5O)_2$; ethylic suberate; obtained by passing hydrochloric acid into an alcoholic solution of suberic acid. It is a limpid liquid, having a faint odor and nauseous taste, boils at 230°, and mixes in all proportions with alcohol and ether. Sp. gr., 1.003.

Suberitidæ, in zoölogy, a family of *Monaxonida* (approximately = the *Monaxonidæ* of Schmidt). The spicules are pin-shaped, densely aggregated in fibers or matted. There is no network of flesh spicules. R. von Lendenfeld enumerates 11 genera, one of which (*Cliona*) dates from the Silurian, and another (*Poterion*) from the Chalk.

Suberitidinæ, in Schmidt's classification of sponges a sub-family of *Monaxonidæ*, approximately equivalent to *Suberitidæ*.

Suberone, $C_8H_{12}O_2 \cdot C_6H_{12}$ (?); a substance obtained by distilling suberic acid with excess of lime; probably the ketone of suberic acid. It is an aromatic liquid, boiling at 176°, but its composition has not been ascertained with certainty.

Sub-genus, a division of a genus consisting of species having common characteristics differing more or less from those of the type, but not of sufficient importance to entitle them to generic distinction.

Subject, that which is placed under the authority, jurisdiction, dominion, or influence of something else. One who is under the authority, rule, or dominion of another; one who owes allegiance to a sovereign, and is governed by his or her laws. That on which any mental operation is exercised; that which is treated or handled as an object of examination, thought or discussion; that concerning which anything is affirmed or denied; as, a subject for inquiry or consideration. That on which any physical operation or experiment is performed; as, a subject for medical treatment. The hero of a piece; the person treated of; as, Byron is the subject of one of Macaulay's finest essays. That in which anything, whether spiritual or material, inheres or exists; substance. Hence, the mind; the cogitative faculty or agent; that being or substance which is self-conscious of its workings. In logic, the term of which the other is affirmed or denied; as, the subject of a proposition. In grammar, the nominative case of a verb. In fine arts, that which it is the desire and aim of the artist to express; as, the subject of a picture. In anatomy, a dead body serving as an object for anatomical dissection. In music, the chief melody or theme of a movement.

Subiaco (ancient Sublaqueum), a city of Italy; in hills beside the Teverone; 32 miles E. by N. from Rome. It was the cradle of the Benedictine Order and the place where the printing press was first set up in Italy (1464). There are two monasteries dating from the 6th century, one of which (Santa Scolastica) contains a small but valuable library, while the other was built near the cave in which St. Benedict lived. The city was greatly favored by Pope Pius VI.; he enlarged its castle (built 1068), erected a church, etc. Pop. 6,503.

Sublapsarians, in theology, those who maintain the doctrine that the decrees of election and reprobation were made by God in foresight of and regard to the fall of Adam and the sin imputed to all his posterity, wherefore, in compassion, he decreed to send his Son to rescue a great number from their lost state, and to accept his obedience and death on their account. The decree of reprobation, according to the Sublapsarians, is nothing but a passing over or non-election of persons whom God left as he found, involved in the guilt of Adam's transgression, when he withdrew some others as guilty as they. Sublapsarian is opposed to supralapsarian.

Sublimation Theory, in geology, the hypothesis that mineral veins, or many of them, have been filled by sublimation. Volatile substances occur both in hot springs and in the gaseous emanations of volcanoes, and might furnish certain constituents for ores and other minerals occurring in veins.

Sublime, that which is grand and awe inspiring in the works of nature or art, as distinguished from the beautiful.

Hamilton thus distinguishes between the sublime and the beautiful: "The feeling of pleasure in the sublime is essentially different from our feeling of pleasure in the beautiful. The beautiful awakens the mind to a soothing contemplation; the sublime rouses it to strong emotion. The beautiful attracts without repelling; whereas the sublime at once does both; the beautiful affords us a feeling of unmingled pleasure, in the full and unimpeded activity of our cognitive powers; whereas, our feeling of sublimity is a mingled one of pleasure and pain — of pleasure in the consciousness of the strong energy, of pain in the consciousness that this energy is vain. . . . That we are at once attracted and repelled by sublimity arises from the circumstance that the object which we call sublime is proportioned to one of our faculties, and disproportioned to another; but as the degree of pleasure transcends the degree of pain, the power whose energy is promoted must be superior to that power whose energy is repressed." He then proposes, instead of the ordinary division of the sublime into the theoretical and practical (or, according to Kant, the mathematical and dynamical), a threefold division: (1) The sublime of extension or space. (2) Protension, or time. (3) Intension, or power; and quotes the following passages from Kant as an admirable example of the sublime in all its three forms:

"Two things there are, which, the oftener and the more steadily we consider them, fill the mind with an ever new, an ever rising admiration and reverence — the Starry Heaven above, the Moral Law within. Of neither am I compelled to seek out the reality, as veiled in darkness, or only to conjecture the possibility, as beyond the hemisphere of my knowledge. Both I contemplate lying clear before me, and connect both immediately with my consciousness of existence. The one departs from the place I occupy in the outer world of sense; expands beyond the bounds of imagination this connection of my body with worlds lying beyond worlds, and systems blending into systems; and protends it into the illimitable times of their periodical movements — to its commencement and continuance. The other departs from my invisible self, from my personality, and represents me in a world, truly infinite indeed, but whose infinity can be tracked out only by the intellect, with which also my connection, unlike the fortuitous relation I stand in to all worlds of sense, I am compelled to recognize as universal and necessary. In the former, the view of a countless multitude of worlds annihilates, as it were, my importance as an animal product, which, after a brief and that incomprehensible endowment with the power of life, is compelled to refund its constituent matter to the planet — itself an atom in the universe — on which it grew. The aspect of the other, on the contrary, elevates my worth as an intelligence even without limit; and this through my personality, in which the moral law reveals a faculty of life independent of my animal nature, nay, of the whole material world; at least, if it be permitted to infer as much from the regulation of my being, which a conformity with that law exacts; proposing as it does, my moral worth for the absolute end of my activity, conceding no compromise of its imperative to a necessitation of nature, and spurning in its infinity, the conditions and boundaries of my present transitory life."

Hamilton adds: "Here we have the extensive sublime in the heavens and their interminable space, the protensive sublime in their illimitable duration, and the intensive sublime in the omnipotence of the human will as manifested in the unconditional imperative of the moral law."

Sublime Porte. See PORTE.

Sublingual Gland, in anatomy, the smallest of the three salivary glands. It is situated along the floor of the mouth, where it forms a ridge between the tongue and the gums of the lower jaw, covered only by the mucous membrane.

Submarine Battery, a vessel capable of being submerged and maintained at a given depth below the surface of the water, and provided with means for penetrating the hull of an enemy's ship below the water line, or of blowing her up — usually a torpedo arrangement, which may be detached from the battery and attached to the bottom of the ship.

Submarine Boat, a boat capable of being propelled under the water. The first was probably that constructed by Drebbel, a Dutchman, for James I., and Robert Fulton made an effort in the same direction in 1801. Among recent submarine boats the most noteworthy is the Holland submarine torpedo boat. See SUBMARINE NAVIGATION.

Submarine Cable, a wire, or combination of wires, protected by flexible non-conducting waterproof material, designed to rest on the bottom of a body of water, and serve as a conductor for the currents transmitted by an electro-magnetic telegraphic apparatus.

Recent Growth.—More than $15,000,000 were spent lately by the Eastern Telegraph Company (English) in laying a cable of 15,000 miles from England to Australia by way of the Cape of Good Hope—more than half way round the globe and nine times longer than the first Atlantic cable; but the fact went almost unnoticed. Two cables, each about 8,000 miles, and costing more than $10,000,000 each, are about to be laid across the Pacific. Compared with these, the Atlantic cables of only 2,000 miles and costing about $2,000,000, now seem short; and it is with astonishment that we read now of the doubt and difficulty of the laying in 1851 of the first successful cable, about 25 miles long, across the English Channel. Since then more than $200,000,000 have been spent on ocean cables and as Marconi's bold experiments in wireless telegraphy have caused some remote fear among those who have "all their money at the bottom of the sea," it is opportune to summarize the astonishing changes that have taken place since the days of Cyrus Field's activity in successfully laying the first Atlantic cable.

Cable communication was first made possible by the discovery of gutta-percha, which led to the construction of a few short cables across rivers; and these in turn led to the cable across the English Channel, after six years of discussion, experiment and failure. Other short cables followed and then the first Atlantic cable was laid in 1858, about 2,000 miles long and from 2 to 3 miles deep. Unfortunately it soon broke down. Not till 1865, after most disheartening failures and losses, was the art of making and laying cables mastered. Thanks chiefly to the indomitable energy of Cyrus Field and the scientific genius of Prof. William Thomson (now Lord Kelvin), obstacles were overcome and the second and third Atlantic cables were laid in 1865 and 1866 by the "Great Eastern." At once a period of great activity in the laying of cables set in, especially about 1870 when the British government purchased the British land telegraph lines. The capital thus liberated, amounting to about $50,000,000, was largely reinvested in submarine cables. It is said that to this fact as much as to the scattered nature of the British dominions, it is due that the cables of the world are so largely owned by British capital.

In 1872 a number of small competing companies with lines through the Mediterranean were consolidated into the Eastern Telegraph Company, and in the following year the Eastern Extension, Australasian, and China Telegraph Company was formed by the amalgamation of companies owning cables farther East. Since then the Eastern, Eastern Extension, and Associated Cable Companies have become practically one immense organization, the "Eastern Company" controlling about 100,000 miles of cables, or about half the total length of cables in the world. Meanwhile the Atlantic cables, steadily increasing, also consolidated till at present, excluding the French cables, there are virtually two great competing companies, the Anglo-American and the Commercial Cable Company (started in 1884). There are now 15 cables across the Atlantic, laid at a cost of about $30,000,000. The first three, laid in 1858, 1865 and 1866, are "dead"; three others are in delicate health; the remaining nine are in perfect condition and likely to remain so for at least 20 or 30 years.

Recently another great cable-laying boom has set in. France proposes to connect its colonies by a system under its own control. A German cable has recently been laid from Emden in Germany to New York via the Azores, which works in conjunction with the Commercial Cable Company. The Commercial Cable Company has recently laid its fourth cable connecting New York and London via Canso, the Azores, and Waterville in Ireland.

The Eastern and its associated companies own a marvelous network. Practically all the cables from Land's End in England through the Mediterranean to Suez, on through the Red Sea to Aden, across the Indian Ocean to Bombay, thence linking into the system Madras, Singapore, Hong-Kong, Manila, Australia and New Zealand, belong to them. So also do practically all the cables which now surround Africa, and many of those which cross the ocean and follow the coastline of South America. To such an organization the laying of 15,000 miles of cable from England to Australia at a cost of over $15,000,000 was comparatively easy. Yet this great line may be traced from Land's End in England to Adelaide in South Australia, a distance which a modern Atlantic liner would take six weeks to steam over.

In the Pacific, the Commercial Cable Company is arranging to lay a $10,000,000 cable about 8,000 miles long, from San Francisco to Honolulu, Guam, and Manila in the Philippines. A still more extraordinary cable is

Submarine Cable

being constructed jointly by the governments of Great Britain, Canada and Australia, across the Pacific from Vancouver to Fanning Island, Fiji Islands, Norfolk Island, and then branching to New Zealand and Australia. It will be about 8,000 miles long and the 3,600 mile stretch from Vancouver to Fanning Island will be the longest single section in the world. In connection with Pacific cables, it is surprising to note that practically all the deep-sea cables of the world are in the hands of the English-speaking nations.

In all there are now about 200,000 miles of submarine cables, enough to go about eight times around the earth. They have cost about $200,000,000, but their market value is considerably higher, as deep-sea cables are solid and profitable investments. Of the total mileage, the Eastern and its associated companies control practically half, or, to be precise, 99,262 nautical miles of cables, with 161 stations, and 11 cable steamers. All told there are 42 cable steamers in the world, including those owned by the cable construction companies and governments, with gross tonnage of about 65,000 tons. There are about 1,700 submarine cables ranging from a quarter of a mile to 15,000 miles. Nearly all the short lines belong to governments, but though only about 420 cables belong to private companies, these include at present all the deep-sea cables and about 90 per cent. of the total length of cables in the world.

The life of a deep-sea cable, aside from injuries by ships' anchors, rocks, sharks, saw and swordfish, has been variously estimated at from 30 to 40 years. Sharks occasionally bite cables and leave some of their teeth embedded, and sawfish and swordfish attack them, especially in tropical waters, but on "the great gray level plains of ooze" 2 miles or more below the surface, cables seem to be almost imperishable. In shallow water they are more exposed to damage. Deep-sea cables weigh from one to one and a half tons per mile, but the portions lying in shallow water are so heavily armored as to weigh from 10 to 30 tons per mile. Yet last year the ocean cables of the Commercial Company were severed by ships' anchors five times. In the Firth of Forth in Scotland no less than 13 ship's anchors were once found entangled in a length of 4 miles of cable.

In the early days the Atlantic Telegraph Company started with a minimum tariff of $100 for 20 words and $5 for each additional word. Later this was reduced to $25 for 10 words. It was not till 1872 that a rate of $1 a word was introduced. This word-rate system proved so popular that it was soon adopted universally and since 1888 the cable rate across the Atlantic has been continuously down to 25 cents a word. Rates now range from the 25-cent tariff across the Atlantic to about $5 a word between England and Peru. The average for the whole world is roughly $1 a word. This the Commercial Company proposes to charge from America to the Philippines, as compared with the present rate of $2.35 by the circuitous route across the Atlantic, through the Mediterranean, the Red Sea, across the Indian Ocean and on to Manila via Hong-Kong. Even from New York to far-away New Zealand the rate is now only about $1.50 per word. The cost of cabling, however, is greatly influenced by "coding," a system by which business men use secret words for commercial messages. A cipher, on the other hand, is a system of secret letters or figures used for secrecy by governments. Practically governments are the only users of ciphers. "Coding" has developed to an extraordinary degree of perfection. One code word will frequently stand for 10 or 15 words, and there are instances where one word has been used to represent over 100 words. Practically all commercial cablegrams are coded, and nearly all departments of commercial and industrial life nowadays have their special codes. The cost of deep-sea cables, about $2,500,000 for a modern Atlantic cable, makes it vitally important to get as much work out of them as possible. In the first place the transmission time of messages has been greatly reduced. Formerly from many parts of the world it took 5 or 10 hours to deliver a cablegram where it now takes from 30 to 60 minutes, and across the Atlantic the companies, for stock exchange purposes at any rate, send a cablegram and get a reply in two or three minutes. In the second place, where traffic is heavy, speed of transmission of the signals has been greatly increased. Across the Atlantic and on three or four of the busy lines of the Eastern Company the art of cable telegraphy has been highly developed.

On the first Atlantic cables the speed was about seven words a minute in one direction only. The speed of recent Atlantic cables is as high as from 40 to 45 words a minute in both directions — that is, from 80 to 90 words a minute. In other words, compared with the early days, the speed and therefore the value of the best cables has been multiplied more than 10 times over by means of some of the most ingenious and delicate machinery in modern industry. On the first Atlantic cable it was found that, using land telegraph methods of signaling, the speed was only one or two words a minute. The first great forward step was to send exceedingly feeble currents and to use extremely sensitive receiving instruments. Lord Kelvin's mirror galvanometer supplied the instrument needed. By this means the speed of the early Atlantic cables was raised to seven or eight words a minute. Subsequently, when heavier cables were laid, the speed

Submarine Cable

was increased to as many as 20 words a minute.

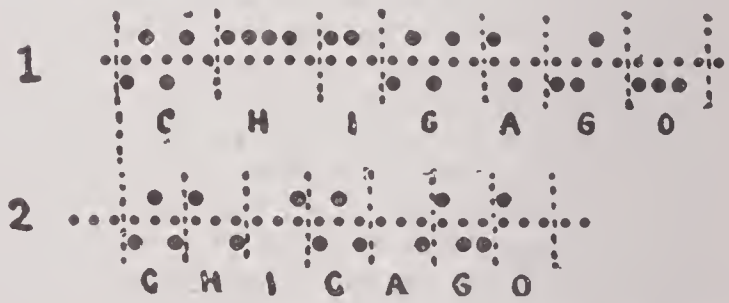
In 1870 Lord Kelvin perfected his siphon recorder for working long cables, and it at once supplanted the mirror instrument, as it worked just as well with feeble currents, gave a written record of signals received and enabled one man to do the work of two. An exceedingly light coil of fine wire (in shape and size like the long narrow O which would be obtained by winding several hundred turns of fine silk thread round the palm of the open hand) is delicately suspended between the two poles of a powerful magnet. As the electric signals from the cable flow through the coil of wire, it swings round under the influence of the magnet, back and forward according as the current is positive or negative. The motions of the coil are transmitted by silken fibers to a little glass siphon about as thick as a needle and three or four inches long, suspended so as to swing with perfect freedom. One end of the siphon dips into a pot of ink and the other end hangs close above a moving strip of paper. The signals are so feeble that if the end of the glass siphon rested on the paper it would not move at all, but by causing the siphon to vibrate continuously against the paper the free motion of the siphon is not interfered with and the ink is spluttered on the paper so that the siphon traces a line of very fine dots and thus records the signals transmitted through the cable. This instrument, though crude at first, has gradually been perfected. It is now the most important part of modern cable apparatus.

The next improvement, undoubtedly the greatest ever made for increasing speed, was the invention of a successful system of "duplexing" cables by Dr. Alexander Muirhead and Herbert Taylor in 1875. This invention rendered it possible to send messages through a long ocean cable both ways simultaneously. In 1878 the Direct United States cable across the Atlantic was successfully duplexed and a speed of 16 words a minute obtained each way at the same time. Duplexing cables has now become such a fine art, chiefly through the labors of Dr. Muirhead, that the capacity of cables and therefore their commercial value has been practically doubled. Since 1875 about 80,000 miles of ocean cables have been duplexed, almost entirely on the Muirhead system. The invention is too technical to describe.

The increasing traffic across the Atlantic and the pressure of competition led next to an increase in the size of the copper "core" which conducts the electric signals. The resistance of a wire delays the electric current and therefore the speed. By doubling the size of the copper core the resistance is halved and the speed greatly increased. The copper wires used for telegraphy on land weigh about 200 pounds per mile. In 1894 two cables were laid across the Atlantic, one for the Commercial Cable Company and the other for the Anglo-American Company. The copper core of the former weighed 500 pounds per mile, while the latter weighed no less than 650 pounds per mile or as much as three ordinary land wires. The result was that the speed obtained with these two cables was as high as 40 to 50 words a minute, or working duplex from 80 to 90 words a minute. On previous Atlantic cables from 25 to 28 words a minute was the maximum each way. Owing to the reduction of rates the benefit of this tenfold increase of speed since the early days has gone almost entirely to the general public.

The increase in speed brought up another difficulty. No human operator can send so fast. The key used for signaling through cables by hand is practically the same as the ordinary Morse key used for land telegraphy except that two keys are used side by side, one to send positive signals and the other negative signals, the letters of the alphabet being indicated by various arrangements of the two kinds of signals. First-class cable operators can send as many as 30 words a minute for a few minutes, but a sustained speed of 20 words a minute when working by the hour is regarded as very good. To take full advantage of the speed of a modern Atlantic cable, therefore, it is necessary to have some automatic method of transmitting. The advantages of automatic transmission are higher speed, greater uniformity of signals, more legibility, and fewer mistakes.

The method adopted is simple and beautiful, a modification of the Wheatstone system. The message is first punched as a series of holes in a paper tape. This perforated tape is then run through an automatic transmitter and by means of a system of small levers the required signals are transmitted at any desired speed. The operator has a wooden stick in each hand with which he strikes one or other of the three keys of the small perforator directly in front of him. One key punches a right-hand hole, another key a left-hand hole, and the middle key makes a space. In this way the cable



SAMPLES OF THE PERFORATED TAPE USED FOR TRANSMITTING MESSAGES THROUGH THE AUTOMATIC TRANSMITTER.

No. 1 shows the word "Chicago" punched in the ordinary cable alphabet, and No. 2 the same word in the new cable alphabet showing equal number of letters and greater brevity and therefore increased speed.

gram before him is transmitted at the rate of about 20 words a minute into perforated tape. From the perforator the tape runs into an automatic transmitter, or "auto." There is a row of small central holes in the tape and on each side is a row of larger holes. The latter represent the message. A small star wheel in the "auto" engages with the central line of holes and feeds the tape along at a uniform rate. A couple of small steel rods about the size of a knitting needle, one for each of the two rows of message holes, continually vibrate against the paper. When either of them enters a perforation in the paper a lever connected with it moves and makes an electric contact sending a short, sharp signal into the cable.

Recently several still more wonderful inventions have been perfected. There is good reason to believe that it is now possible to work a typewriter in New York by playing on a typewriter keyboard in London, and vice versa.

The little tape perforator in the first machine of the series has three keys. These have to be struck on the average four times for each letter, and much practice is required to become skillful in using it. Several tape perforators with ordinary typewriter keyboards have been invented. The success of a machine of this kind will mean that cable messages will be transmitted by simply playing on a typewriter keyboard, the striking of the keys perforating the transmitting tape which then runs through the "auto," this sending signals through the cable to the other end, where they are written in ink by the siphon recorder. It is at this latter point that has lain the great difficulty that has baffled cable inventors for years. By the time that an electric signal has passed through a long section, say 1,000 miles, of ocean cable, it has become so feeble that it can only be recorded by the extremely delicate mechanism of the siphon recorder. It has not been possible till recently to retransmit automatically into another section. On land, relays are used. For instance, messages from New York to Chicago are automatically repeated at Buffalo or Meadville, and by automatic repeating every 600 or 800 miles, it is an everyday occurrence to telegraph direct between New York and San Francisco. A relay capable of performing similar work for cables has been a dream of cable engineers and inventors for years, and in default of such an instrument "human relays" have been employed; that is, at the end of one section of a cable an operator takes the paper tape record of a cablegram as it comes from the siphon recorder and retransmits it.

But the cable relay is now an accomplished fact. The only hope of constructing such an instrument was to utilize the siphon recorder. One difficulty has been that the movements of the siphon, as shown by the

Submarine Cable

paper records, have been up till recently most irregular. There has been what photographers would describe as "lack of definition" about the signals, rendering it hopeless to attempt to relay them automatically by machinery. The first thing to do was, therefore, to straighten and sharpen up the signals a bit, and a very able group of cable engineers, including H. A. C. Saunders, electrician-in-chief of the Eastern and its associate cable companies and his assistant Walter Judd, also Dr. Muirhead, inventor of the cable duplex, and Messrs. Brown and Dearlove succeeded in sharpening them. They secured very regular signals, usually described as "square signals." This result was obtained by means too technical to be described here, but the chief device used is known as an "inductive shunt." Having squared the signals, it was now possible, though by no means easy, to construct a cable relay. Two have recently been perfected. One is known as the Brown and Dearlove relay, the principal inventor of it being S. G. Brown. The other has been invented by Dr. Muirhead. In both a fine wire terminating in a platinum contact point takes the place of the ink in the siphon of a recorder. The contact point, instead of resting on the paper tape, rests on a rapidly moving metallic surface divided into two parts. In the Brown and Dearlove relay this contact surface consists of a constantly revolving metallic drum or wheel. The siphon with its wire and contact point "skates," as the inventor describes it, with utmost freedom on the periphery of this wheel. The drum looks like a phonograph cylinder. As the siphon skates on the right or left half of this drum it makes a positive or a negative electric contact and automatically transmits a corresponding signal with renewed energy into the next section of cable. In the Muirhead relay the moving surface consists of a small plate vibrating rapidly. The result is the same.

From this description of cable relays it will be seen that an operator by playing on a typewriter keyboard in London can now produce a perforated paper tape in New York. A machine invented by the writer of this article is so arranged that by simply turning a handle it works a typewriter automatically under the control of a perforated paper tape, something after the fashion of a mechanical piano, at a speed of 90 words a minute. It is now possible, at any rate theoretically, automatically to typewrite a cable message across the Atlantic in page form at a speed 12 per cent. faster than the cables can at present be operated. More than this, by the same mechanism it is feasible to operate a linotype or typesetting machine automatically so that fantastic possiblity presents itself of playing on a typewriter keyboard in London and setting type automatically in New York.

It will thus be seen that deep-sea cables have shared in the astonishing revolution caused by the perfecting of automatic machine methods during the past 20 years. And it is in the highest degree improbable that a long record of wonderful human achievement like that which has been described in this article will be brought to naught by any new invention howsoever ingenious or revolutionary. There is room enough in the world for both wireless and cable telegraphy, and indeed Mr. Marconi has already done good service to owners of cables, because his unique feat of signaling across the Atlantic has rendered the cutting of cables in war times useless.

DONALD MURRAY.

Submarine Denudation, in geology, denudation produced by the action of marine currents on the bed of the sea. Though during storms the sea is agitated only to the depth of a few fathoms from the surface, yet extensive currents can operate at greater depths; besides which the now existing depth of particular portions of the sea may have been much less at some former periods. The amount of denudation which takes place on the sea cliffs is probably only an insignificant fraction of the whole volume of marine denudation.

Submarine Forest, in geology, the remains of a forest beneath the present level of the sea. Such a forest exists along the N. shore of Fifeshire, Scotland, and beyond that area. It consists of a peat bed, with the roots, leaves, and branches of trees. The Rev. Dr. Fleming attributed it to the encroachments of the sea; Lyell thought that it more probably arose from subsidence. A smaller forest of oak, yew, etc., with their trunks and roots as they grew, occurs at the mouth of the Parret in Somersetshire, England. It was described by Mr. Leonard Horner in 1815, and attributed by him to subsidence. A forest beneath the sea-level at Bournemouth, discovered by Mr. Charles Harris in 1831, is believed to have reached the present low level by the encroachment of the sea. Many others are known.

Submarine Mines, explosives placed under water in a harbor, or along the coast, to destroy the vessels of an enemy. Submarine mining originated with the Germans who used it with great effect during the Franco-Prussian War. The American-Spanish War demonstrated the inefficiency of torpedoes and torpedo boats against rapid-fire guns, but the submarine mines remained a constant source of dread to the battleships. The sea coast of the United States, both E. and W., and the harbors of New York, Boston, New Orleans, and San Francisco were well protected by them, and their number, in some places, would have proved dangerous to the merchant shipping, had it not been for modern appliances. There are three kinds of submarine mines in use, the "contact," "observation," and the "ground" mine. The first mentioned is the simplest, but is not so generally used as the others. It consists of a buoyant iron case containing an explosive and attached by a cable to an anchor which holds it in place. From the case project a number of points, each armed with a firing pin. If an obstacle strikes one of these the pin is driven in and the charge exploded. As will be seen, this mine must be greatly affected by the tide. At times the ball will be a great distance below the surface of the water; again it will be near the surface. To do damage to the bottom of a vessel the explosion must take place at least eight feet below the water line; consequently the contact mine is useless except when the tide is at a certain height. The best ground mine cases are similar to those used by the Confederates in the Civil War and called "turtleback," but are heavier and stronger in make. These are exploded by electricity from the firing station and are used preferably to any other. It is now conceded that it is the total number of submarine mines, rather than the great exactness of location, which will best protect a passageway, and aided by a line of coast artillery, forms the surest defense against the advances of an enemy's vessels.

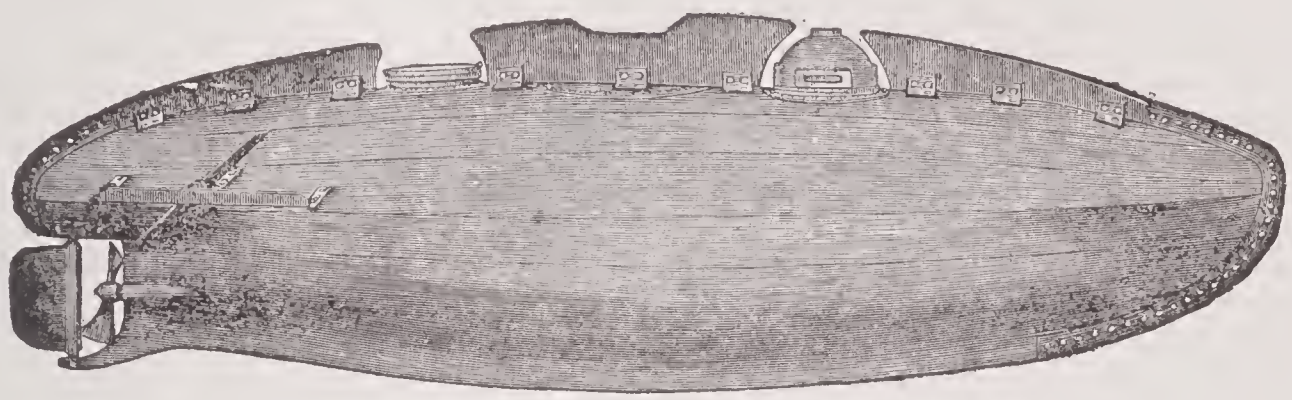
Submarine Navigation, the art of navigating a vessel under water. At the famous siege of Syracuse (212 B. C.) trained divers were employed, but they were unable to remain under water more than a few minutes. We have no record of the means which they used for the supply air. For the last 200 years efforts have been in progress for employing boats in submarine works; but the success has only been partial. In order to do full service the submarine boat must be so constructed as to give fresh air (520 cubic inches per minute for each man); the means of freeing air from poisonous impurities arising from exhaling carbonic acid gas; the means of giving and governing motion to the submarine boat; and room for the workmen while under water. Most of the earlier plans employed proved failures, either in whole or in part. In 1774 an inventor named Day lost his life during an experimental descent in Plymouth Sound in a vessel about 50 tons burden; he intended to make it rise after a submersion of considerable duration, but failed. Mr. Bushnell, of Connecticut, contrived in 1775 a submarine vessel intended to have been used in warfare; it appears to have been propelled by some kind of an Archimedean screw. Robert Fulton, while in Paris in 1796 invented a box which, when filled with combustibles, might be propelled under water and made

Submarine Navigation

to explode beneath the bottom of a ship, so as to blow it up; but the attempt was a failure. He also made a submarine boat for the same purpose, which was tried on several of the French rivers with partial success; later in his life he really blew up an old ship's hull by such means in the United States.

Some of the suggestions for submarine navigation have depended on the ship or boat carrying store vessels filled with oxygen to replenish the air, the carbonic acid being absorbed either by cream of lime or a strong solution of ammonia. Attention was directed in 1859 to a submarine boat constructed by Mr. Delany, of Chicago. According to his patent, the vessel was egg-shaped in transverse section, and diminished nearly to a point at each end. There was a rudder at one end of a hollow shaft, and the axis of a screw propeller passed through the shaft. The boat was completely inclosed on all sides, except certain pipe openings. There were two iron tanks in the interior; one had air forced into it by an air pump; a pipe with a stopcock communicated with the second tank, which contained water. The engineer of the boat, by pumping water into or out of the second tank, through the action of the air in the first, could raise or lower the boat to different depths in the water. A steam engine was to furnish the propelling power. The embarrassments to its use were too many and difficult to permit its permanent success. Later, a boat called the "Intelligent Whale," having an extended egg-shape, and provided with most needful contrivances, was exhibited in Brooklyn, N. Y. It proved, however, too cumbrous for convenient use. In recent years the attention of inventors has been directed toward submarine navigation for purposes of naval attack and defense.

Goubet, of Paris, in 1882, constructed a submarine boat with such success as to receive an order from the Russian government for 300 sets of his machinery. In the Russian boats electricity is the motor, the speed obtained being five knots. The crew can be reduced to an officer and one man, who enter the craft at the top by a dome-shaped hatch secured with hinges and bolts, and fitting into a rubber-lined recess. In a reservoir is a supply of compressed air said to be sufficient to last the two men for 10 hours, while the carbonic acid they give off is absorbed by caustic potash distributed through the boat. In this, as in all submarine craft, the object is not pleasure, for little of that is to be had, but warfare. At one end of the boat is fastened a torpedo charged with 110 pounds of dynamite, arranged so as to be operated from within. A description of this boat shows that there are seven glazed openings in the hull, with glass one-half inch thick, protected by external gratings and internal shutters. The two men sit back to back on the compressed-air reservoirs. The craft seems to be full of machinery, except in the space occupied by the men, and their heads go up into the dome. But the boat can thus be made small and compact, so as to be rowed with oars if the dynamo fails. There is a pump for expelling water from the reservoirs when the boat has to rise, and these reservoirs, which effect the immersion of the boat are divided into several compartments to prevent the water in them from surging forth and back. There is an air pump for extracting the vitiated air, and a double-acting pump to secure the stability of the vessel. As a safety appliance a heavy weight is attached to the bottom of the boat, which may be released and dropped off in case of an accident requiring a rapid ascent. An explosive signal for help can also be sent to the surface. When the two men enter the boat they turn on the compressed air, which is passed through the water reservoirs so as to become humid, and start the electrical motor. The officer steers the boat under the ship to be attacked; and when the right position is gained he casts off the torpedo, which floats up and attaches itself to the vessel by contrivances provided for the purpose. The boat then rapidly withdraws, and at a safe distance explodes the torpedo by electricity.



THE SUBMARINE BOAT "PEACEMAKER."

Submarine Navigation

A different and much more elaborate craft is that of Nordenfelt. In this the motive power is steam derived from an ordinary boiler when the boat is on the surface, and steam stored up in hot-water reservoirs when the boat is submerged. This storage steam, under great pressure, is obtained by developing extra steam when on the surface, and forcing it into two strong tanks. This steam is also the power employed to submerge the craft, which rises to the surface by its own buoyancy whenever the pressure is removed. It is remarkable that the air space is found adequate for breathing during several hours, so that no compressed air is provided, and even no chemicals for purifying the air, though there is an apparatus for cooling it. This craft is cigar-shaped, like nearly all submarine boats from the time of Mr. Ross Winans, with a low glass cupola or conning tower on top. It is much larger than the Goubet boat, being in fact 64 feet long by 12 feet beam and 11 deep. The hull is of steel, averaging about one-half inch thick, on strong angle-iron frames. Its best feature, perhaps, is a set of balanced rudders actuated by a pendulum in the hull, which keep it always horizontal and steady; while two small propellers placed in sponsons on either side and worked by steam, carry it down to any required depth. As the boat at once rises to the surface unless kept down by steam power, an accident to the machinery would carry her up; yet, to guard against the extra danger of leakage, eight tons of hot water can be blown out, so that she then cannot fail to rise. There is also an automatic apparatus for causing the vertical propellers to stop when a given depth is reached, and to start again when the boat rises. Four men have been shut up six hours in the boat without inconvenience; but three are found sufficient, and crews seem more willing to go in her on account of the use of an ordinary steam motor and the provision for breathing ordinary air. The boat has traveled on the surface 150 miles without recoaling. It has torpedoes for use in action. Nearly 40 officers, representing all the European powers, were present at the Landskrona trials of the Nordenfelt boat. The boat went down four times in succession to show the ease of working the propellers, the last time staying five minutes at a depth said to be 16 feet below the surface. In a very rough sea she showed her handiness in steering. After the crew were shut up three hours they exhibited no signs of having been inconvenienced. During one day's trial the boat made a run of 20 miles at the surface, with the cupola and a little of the turtleback showing at eight knots an hour in a rough sea. Finally, the London "Army and Navy Gazette," gives this account of a simulated attack on the tug "Svea": "When starting the boat was on the surface, and while advancing she slowly descended, so that when about 1,800 to 2,000 yards from the "Svea," only half the cupola (some nine inches) would be seen above water. At this level she advanced till about 1,000 yards from the "Svea," when she descended entirely under the surface, and advanced altogether unseen for 400 or 500 yards, which occupied four and one-half minutes. During the remainder of the distance the boat rose to the surface and descended again four times while still advancing, till within some 200 yards of the "Svea," a supposed certain striking distance for any Whitehead torpedo, when the boat came to the surface and turned round; the crew, opening up the cupola, came outside, and the experiments were finished." In the United States considerable progress has been made in submarine boat construction.

A modern submarine boat was built by George C. Baker for experimental purposes and launched on Lake Michigan in 1892. It made many successful trips. In 1897 Simon Lake, of Baltimore, Md., launched a submarine wrecking boat named the "Argonaut." It is designed to roll along the bottom of the sea like a locomotive, and to explore the bottom of the ocean for sunken treasures. The vessel is operated by steam when on the surface and by an electric motor when under water. It has heavy driving wheels in front, while those in the rear run loose and support the weight. In the floor of the divers' compartment, which latter is air-tight, there is a door that drops downward to permit any one to leave the room and go out on the bottom of the sea. This boat in 1898 made a voyage of 200 miles under and on the surface of Lake Champlain.

The little craft built by J. P. Holland (*q. v.*) in 1897 and named for its inventor was the result of years of experiment; Mr. Holland's first successful model being the "Peacemaker." This was followed by the "Holland," which was perfected in 1899 and put in training for war service in the United States navy as a torpedo boat. It can dive like a duck and runs under the water at the rate of four and one-half knots an hour. On the surface it makes about 10 knots an hour. It carries three torpedo tubes and uses the largest size of Whitehead torpedoes. When submerged nothing of the boat can be seen but the tops of its flagstaffs and a small portion of the conning tower. The steering is all done by means of a compass in the conning tower, and is the same as when directing a vessel in a dense fog, though the danger is much less. Two small brass wheels, one on either side of the conning tower, are used to place the boat in any position desired. The

Submarine Oil Wells

one operates the vertical rudders and changes the course of the craft; the other directs the horizontal rudders which send it deeper into the water or bring it to the surface. The interior of the boat is brilliantly lighted by electricity and there is ample room for a crew of six men. The steering engines, of which there are two sets, are operated by compressed air of which enough is let into the boat through the engine's valves to supply the men. It carries sufficient fuel and electricity to give it a cruising radius of 1,500 miles at a speed of 6 knots an hour. In 1901 Mr. Holland completed a larger model called the "Dolphin," in which a crew remained submerged for 15 hours, without suffering the least inconvenience.

A submarine torpedo boat has been built in France and named the "Gustave Zede," after its inventor. It has a cigar-shaped hull and is 131 feet long. It has a displacement of 266 tons and carries a crew of eight men. The motive force is electricity stored in accumulators and the boat is able to sink to a depth of 100 feet and moves about under the water at a rate of 10 knots an hour. The most striking thing about the "Zede" is its wonderful "eye," which consists of an electric light surrounded by very powerful refracting lenses; these are similar in construction to the lenses of a lighthouse lantern. This "eye," which was the invention of two young lieutenants, makes it possible for the crew when under water to see ahead of them for 100 yards or more. It is fixed just above the conning tower. There are two torpedo tubes in the "Zede," one on each side, and it has been proven that a vessel can be hit while going at full speed. The immersion of the boat is regulated by the action of horizontal rudders, and it can go up and down 12 times in an hour, even under heavy seas.

Submarine Oil Wells. At Summerland, California, there are about 100 submarine oil wells in successful operation, and as many more wells scattered along the beach between the limits of the highest and lowest tides. The wells furthest from shore are in from 15 to 25 feet of water at low tide. The method of drilling these wells as compared with the gigantic projects proposed for reclamation by walling off the sea on the coasts of Bibi-Eibat and the Island of Swjitoi, or the draining of Romany lake at Baku for the purpose of drilling petroleum wells, is simplicity itself.

The drilling of submarine oil wells, as performed at Summerland, primarily involves the construction of a wharf from the shore to some point over the oil-producing strata, or across the region where the borings are contemplated. In strength of structure these wharves have been built in considerable variety, from those consisting of a mere double row of piles with 8x8 crossbeams and stringers and with a narrow walk from one to five feet wide as the only means of access to the wells situated upon them, to strong and commodious structures thoroughly planked and capable of withstanding either the heaviest southeasters which visit that coast or bear any kind of traffic to which a wharf might be subjected.

A peculiar condition in connection with these wharves, which is of uncommon interest, is their immunity from the teredo. The oil wasted from the many wells both on the wharves and on shore is often seen floating on the surface of the sea. This either drives off the destructive teredo (*Xylotria pennatifera*), which are quite plentiful in those waters, or else makes it impossible for those pests of the sea to find lodgment in the oil-coated piles. The oldest piles have been driven nearly four years, and there has been no deterioration whatever in any of the wharves, due to shipworms or any other form of marine life.

Upon the completion of the wharf, or so much of it as is neeessary for the immediate purpose, the drilling machinery is assembled at the location for a well. In beginning the drilling operations the first important work to be done is in putting down what is locally termed a "conductor." The conductor consists merely of oil-well casing of a size larger than that with which the well would have been started were there no sea to contend with. Often casing of inferior quality is used for this purpose, and it is sometimes put down without a shoe where the previous borings indicate that no cobblestones will be met in passing through the sea sand. Usually 9⅝ casing is used, but for the shallower wells 7⅝ is sometimes adopted.

In starting the conductor in from 15 to 25 feet of water, two joints of 9⅝ casing are screwed together, making a length of from 30 to 45 feet, or of sufficient length so that when the shoe or bottom end is resting on the sand under the water, the top end will extend well up toward the top of the roof in the derrick. In setting it, the conductor is held suspended by the sand line in an upright position with the shoe about a foot above the sand. It is then plumbed as nearly as can be, and, watching a favorable opportunity when the wash of the water is least violent, it is suddenly dropped to the sand. It is then accurately plumbed while resting on the ground under the ocean, and is secured in its vertical position by means of boards nailed to the derrick floor in such a way that their edges bear against the casing from four different directions. The drilling stem, which has been previously fitted with

a driving head and clamps, is then run into the conductor, and it is driven into the sand as far as it will safely go. Then the clamps are removed and the drill set to work, and by alternate drivings and drillings the conductor is worked through the sand to the clay beneath, where it is discontinued. By the time the top of the conductor has been driven to the level of the derrick floor the bottom end has become so deeply embedded in the sand that the stays can be removed and the casing driven beneath the derricks to a point near the level of the water underneath. Should it then prove too short to penetrate the sand, other lengths are screwed on and the operations continued till that object is attained. When the conductor has been driven a few feet into the clay underlying the sea sand, the ocean is effectually shut off from the well, for all practical purposes. However, there is still danger of letting the ocean water into the well through the carelessness or incompetence of the driller. It is quite essential to change the drilling bit to the next smaller size immediately on stopping the conductor or whenever it is decided to go no further with any size of casing, and also to keep the casing following closely after the drill. Otherwise, when drilling ahead of a conductor or casing that is permanently stopped, before reducing the size of the bit, there is danger of water breaking through from above into the new boring; and when drilling too far ahead of the casing the tools are liable to gain more and more swing, cutting the hole larger and larger, especially in either clay or shale strata, thus creating a cavity of much greater diameter than the casing will fill and which frequently becomes a watercourse outside of the casing, causing the ruin not only of the well, but also of the adjacent oil territory. In other respects the drilling of submarine wells differs little from those put down on land.

Submarine Photography, the process of taking photographs under water. The practicability of submarine photography has been demonstrated by Dr. L. Boutan, Professor of Zoölogy at the University of Paris. He has made successful experiments, to the depth of several thousand feet, on the S. coast of France and in the waters of the Mediterranean. Dr. Boutan in taking these photographs wears the regular diver's suit and extra heavy leaden shoes, so as to get a good foothold and steady his gait on the bottom of the sea. He uses the ordinary outfit of a photographer, with the exception that he has it all protected by waterproof coverings. He places his Leyden jars in a barrel which is surmounted by a bell glass provided with the necessary lamp. The latter is a spirit lamp to which it attached a receptacle for the magnesium powder connected with the usual pneumatic ball and tube. The photographs are taken by the instantaneous flash which follows the scattering of powdered magnesium into the flame. He has a branch tube connected with the pneumatic ball which forces a puff of air into the powder and carries it into the flame, exposing the lens at the moment of maximum light. The pictures taken at the bottom of the sea by this process show no material difference from those produced in the ordinary way by the instantaneous method, with one exception, that the negatives have a peculiarly soft tone. Many curious residents of the water have been photographed by Dr. Boutan, as well as beautiful aquatic plants and exquisite "sea-landscapes." In addition to the novelty and pleasure of taking these submarine pictures, the art can be put to a practical use in locating wrecks and in searching them for lost property.

Submarine Telegraphy, the transmission of messages by electricity under the sea. The sending of messages by telegraph from one country to another, through wires buried many thousand feet beneath the water has come into general use since 1851, though the conception of its possibility dated back many years prior to that time.

The very first suggestion that was ever made about a submarine cable was that made in the year 1795 by Salva, a Spaniard, before the Academy of Sciences at Barcelona. Two years later this same Spaniard proposed to connect Barcelona and the island of Majorca by a submarine telegraph line. In 1803 Aldini, who was a nephew of the celebrated Galvini, made some interesting experiments in the transmission of electric signals under the sea near Calais, France. In 1812 Schilling ignited powder by electricity transmitted through a subaqueous conducting wire under the Neva river, near St. Petersburg. John Robert Sharpe of England transmitted electric signals through seven miles of insulated subaqueous wire. This was in 1813.

In 1838 it was demonstrated that subaqueous telegraphy was a matter which could be practically handled. This was done in actual experiments by Colonel Pasley of the Royal Engineers at Chatterton in England. Just one year after Pasley's work in England Dr. O'Shaugnessy, the director of the East India Company's telegraph system, transmitted telegraphic signals through insulated wires under the Hugli river in India. About this time numerous inventors in many parts of the world thought of new experiments, and the art of submarine telegraphy began to grow.

Prof. Charles Wheatstone of England suggested in 1840 the practicability of connecting Dover, England, with Calais, France, by a submarine telegraph. In the United States Samuel F. B. Morse, in 1842,

transmitted electric signals along a copper wire between Castle Garden and Governor's Island in New York harbor. In 1843 Professor Morse suggested the possibility of connecting Europe and the United States by a submarine cable line. Meanwhile Samuel Colt was operating submarine cables between New York city, Coney Island and Fire Island.

In 1845 Ezra Cornell, laid 12 miles of copper wire in the Hudson river between New York and Fort Lee. The wires were insulated and inclosed in a lead pipe and were successfully operated till they were destroyed by ice. In 1846 Charles West obtained permission from the British government to connect Dover and Calais by copper wire, and one year later J. J. Craven of the United States, a resident of New Jersey, conducted a section of the New York and Washington telegraph line through the waters of a creek. The experiment was successful in every way. In 1849 Armstrong proposed that a telegraph line be laid between Europe and the United States.

In 1851 the first important submarine telegraph line was opened for business. It was laid by a company of English and French capitalists. The cable consisted of four copper wires, insulated with gutta-percha, surrounded by tarred hemp and protected by 10 galvanized iron wires wound spirally around it. The weight of this cable was seven tons to the mile; it was 25 miles long, and was sunk in 120 feet of water. In 1853 six submarine cables were laid connecting various parts of England, Ireland and Scotland. In the following year five more cables were laid in Europe, the longest of which was 64 miles. In 1856 several cables were laid in waters much deeper than formerly. One of these, running from Spezia, Italy, to Corsica, weighed eight tons to the mile, and was sunk to a depth of 600 feet

For the later development of the cable, See ATLANTIC CABLE: SUBMARINE CABLE.

The following table gives a list of the cable systems of the world.

Companies.	Number of Cables.	Length of Cables in Nautical Miles
Anglo-American Telegraph Co.....	14	9,554
Transatlantic System — Valentia (Ireland) to Heart's Content (Newfoundland).		
Minion, near Brest (France), to St. Pierre-Miquelon.		
Commercial Cable Co.....	9	11,663
Transatlantic System — Waterville (Ireland) to Canso (Nova Scotia).		
Canso, N. S., to New York.		
Canso, N. S., to Rockport, Mass.		
Emden, Germany, via Azores, to New York.		
Direct United States Cable Co.....	2	3,100
Ballinskellig's Bay (Ireland) to Halifax (Nova Scotia).		
Halifax, N. S., to Rye Beach, N. H.		
Western Union Telegraph Co.....	13	7,478
Transatlantic System — Sennen Cove, near Penzance, England, to Dover Bay, near Casno, N. S.		
Dover Bay, N. S., to New York.		
Gulf of Mexico System.		
Compagnie Française des Câbles Télégraphiques	32	12,102
Brest (France) to Cape Cod, Mass.		
Brest (France) to St. Pierre-Miq.		
St. Pierre to Cape Cod, Mass.		
Cape Cod, Mass., to New York.		
African Direct Telegraph Co.....	8	2,943
Black Sea Telegraph Co.....	1	337
Western Telegraph Co.....	27	17,260
Carcavellos, near Lisbon (Portugal), to Madeira, to St. Vincent (Cape Verde Island), to Pernambuco, Rio de Janeiro, Santos, Montevideo.		
Central and South American Telegraph Co.....	14	7,500
Compagnie Allemande des Câbles...	3	5,253
Compania Telegrafico-Telefonica del Plata	1	28
Cuba Submarine Telegraph Co.....	10	1,143
Direct Spanish Telegraph Co.....	4	716
Direct West India Cable Co.....	2	1,265
Bermuda - Turk's Island, and Turk's Island-Jamaica.		
Eastern and South African Telegraph Co.....	15	9,077
Eastern Extension Australasia and China Telegraph Co.....	34	18,153
Eastern Telegraph Co.....	93	39,473
Anglo - Spanish - Portuguese System.		
System West of Malta.		
Italo-Greek System.		
Austro-Greek System.		
Greek System.		
Turko-Greek System.		
Turkish System.		
Egyptian System.		
Egypto-European System.		
Egypto-Indian System.		
Cape Town to St. Helena.		
St. Helena to Ascension Island.		
Ascension Island to St. Vincent.		
Europe and Azores Telegraph Co...	2	1,053
Great Northern Telegraph Co.....	30	7,946
Cables in Europe and Asia.		
Halifax and Bermuda Cable Co....	1	849
Indo-European Telegraph Co.....	3	23
India Rubber, Gutta Percha, and Telegraph Works Co.....	3	145
Mexican Telegraph Co.....	3	1,528
River Plate Telegraph Co.....	1	32
South American Cable Co.....	2	2,049
United States and Haiti Telegraph and Cable Co.....	1	1,391
West African Telegraph Co.....	11	3,000
West Coast of America Telegraph Co.	7	1,979
West India & Panama Telegraph Co.	24	4,639
Grand total	370	171,479

The submarine telegraphs of the world in 1902 numbered 1,750. Their aggregate length was nearly 200,000 miles; their total costs estimated at $275,000,000, and the

Submarine Telegraphy

number of messages annually transmitted over them more than 6,000,000. All the grand divisions of the earth are now connected by their wires, and from country to country and island to island the thoughts and words of mankind are instantaneously transmitted. Beneath all oceans save the Pacific the universal language which this system has created flows uninterruptedly, and man talks as face to face with his fellow-man at the antipodes. Darkest Africa now converses daily with enlightened Europe or America, and the great events of the morning are known in the evening throughout the inhabited world. Adding to the submarine lines the land telegraph systems by which they are connected and through which they bring interior points of the various continents into instantaneous communication, the total length of telegraph lines of the world is 1,180,000 miles, the length of their single wires, or conductors, 3,800,000 miles, and the total number of messages annually sent over them about 400,000,000, or an average of more than 1,000,000 each day.

In the short half century since the practicability of submarine telegraphy was demonstrated, every body of water lying between the inhabited portions of the earth, with the single exception of the Pacific Ocean, has been crossed and recrossed by submarine telegraph lines. Even that vast expanse of water has been invaded along its margin, submarine wires stretching along its W. border from Siberia to Australia, while its E. borders are skirted with lines which stretch along the W. coasts of the two Americas. Several adventurous pioneers in Pacific telegraphy have ventured to considerable distances and depths in that great ocean, one cable line running from Australia to New Zealand, a distance of over 1,000 miles, and another extending from Australia to the French colony of New Caledonia, 800 miles seaward. A cable which is to connect Canada with Australia across the Pacific is now being laid at the joint expense of the United Kingdom, Canada and the Australian commonwealth.

The chief obstacle in the past to the construction of a grand transpacific cable was found in the fact that mid-ocean resting places could not be satisfactorily obtained or arranged for, no single government controlling a sufficient number of suitable landing places to make this seem practicable in view of the belief that the distance through which messages could be sent and cables controlled was limited. With landing places at Hawaii, Wake Island, Guam and the Philippines, however, no section of a cable stretching from the United States to Asia and touching at these points would have length equal to that now in daily operation between France and the United States. The length of the French cable from Brest, France, to Cape Cod, Massachusetts, is 3,250 miles, while the greatest distance from land to land on the proposed Pacific route would be that from San Francisco to Hawaii, 2,089 miles; that from Hawaii to Wake Island, 2,040 miles; from Wake Island to Guam, 1,290 miles; from Guam to Manila, 1,520 miles, and from Manila to the Asiatic coast, 630 miles.

While the depth of the Pacific is somewhat greater than that at which any cable has been laid, the difference between its depth and the greatest depth reached by cables in the Atlantic would be very slight, the cable recently laid from Haiti to the Windward Islands being in 18,000 feet of water. The recent survey for a cable between the Pacific coast and Manila justifies the belief that a route can be selected in which the depth will not exceed 20,000 feet and may not exceed 18,000 feet. The recent survey made by the Bureau of Equipment, Navy Department, under the direction of Rear-Admiral R. B. Bradford, disclosed that the greatest ocean depth heretofore known, lying between Midway Island and Guam, is 31,614 feet, or only 66 feet short of 6 miles. This depression, however, which has been named the "Nero deep," in honor of the vessel from which the sounding was made, can be avoided by a detour.

How the Cables are Laid.— Anyone who, for a comparatively small sum, is able to carry on a conversation by cable from one side of the world to the other is little prone to consider, in doing so, the wonderful preparations necessary, the enormous expenditure, the amount of hard and exact thinking and surveying that go before the facilities we now possess. All over the world cables stretch and coil, crossing, intersecting, penetrating further and further. And to every branch and system is attached a fleet of ships to look after them, and a bevy of highly-trained electricians to keep them in working order. To get a full idea of the process gone through in laying a cable, one cannot do better than note what takes place — supposing the cable to be duly manufactured and ready to be dropped into position along the bed of the ocean.

The cable is put on board one — perhaps two — specially fitted vessels belonging to the company laying the cable. Such a vessel is fitted with what appears to be a most complicated system of machinery. The cable itself is coiled in circular iron tanks. Over each of these tanks is a system of guides that leads the cable into a long trough laid along the deck to what is known as the "paying out" gear. This gear is composed of one large overhanging drum on which the cable is reeled, and two inside pulleys, the bottom part of which runs through a tank of water. Surrounding it

are many complicated instruments for indicating the amount of cable paid out, the strain on it, and the speed at which the drum revolves. All these are of a nature far too technical to be described here.

We have taken it for granted that the cable can be laid. But many are the difficulties attending the operation. Frequently the process has to be suspended owing to fog, storms or some unforeseen error in surveying, and in this latter business the cleverest are sometimes baffled by the unseen depths of the ocean. The ideal bed on which to lay a cable, is one composed principally of ooze — that is, a soft deposit that accumulates on the ocean bottom. To find such a bed, level and comparatively soft, is a great piece of good luck, and one that has attended the cable company that has laid a line from Halifax, in Nova Scotia, to Bermuda, from Bermuda to Turk's Island, and so on to Jamaica.

This cable was laid in 1890, and so perfectly was the surveying done and the arrangements for laying it in the first instance conducted, that not a penny has been expended on it since. In the old days of cable-laying the chief idea was to drop it overboard into the ocean and leave the rest to chance. Now, in surveying all along a line between two points where it is proposed to drop a cable, soundings are taken for 10 miles on either side, and the slightest suspicion of hillocks or crevices in the vicinity will widen out the surveying perhaps for three or four times the distance. Every cable must be laid flat on the bed of the ocean, and not sag between two unequal pieces of ground, or festoon from one high point to another.

So it will be seen that if the cable can be dropped into ocean ooze, sand, or a coral bed and be gradually covered up it will lie snug and safe for any number of years. Near shore, ground swells and undercurrents are apt to hurl the cable to and fro with a pulling movement perilous to its safety. To obviate this, specially heavy cables are used so that they may sink at once right into the ground out of range of the heavy ground swells.

Perhaps it would be well here to give some clear idea of the cable itself. Such a one constructed for coast lines is composed of a conductor of seven-stranded copper wires. This conductor lies enveloped in a covering of gutta-percha, the gutta-percha acting as an insulator and preventing loss of current when transmitting messages. The gutta-percha core, so formed, is covered with a bedding of tarred jute yarn. This bedding protects the gutta-percha from being damaged by 12 galvanized iron wires, which are laid around it. The sheathed cable has then an external covering composed of two preservative tapes, which protect the wires from the action of the sea water.

These tapes, previously saturated in a bituminous compound, are laid on helically. This kind of cable is called the "deep-sea" type. A stronger type is used for landing purposes, where there is a risk of damage from anchors or from a rocky bottom. Such a cable is known as a "shore-end" type, and is composed of the "deep-sea" with a second sheeting of 14 large-sized galvanized iron wires, rather in the shape of white beans. The "deep-sea" type of cable weighs four and half tons, and the "shore-end" type as much as 14½ tons per nautical mile. But in the "shore-end" cable there is a little circular brass tube enclosing the gutta-percha surrounding the copper conducting wire. This we have not mentioned before. It is specially contrived to frustrate the industrious meandering of a peculiar species of ocean worm, known as the teredo. This little oceanic traveler quickly proves himself a source of worry to the cable companies. He works with a little natural chisel, boring a contented way through everything on which he can get a satisfactory hold. Through the jute between the galvanized iron wires he bores his way, but when he is confronted by a smooth brass wall his little chisel works in vain. He can get no purchase, and is baffled, and, it is to be hoped, discouraged by this example of human ingenuity in dealing with ocean worms.

Substance, in philosophy, that which is and abides as distinguished from accident, which has no existence of itself, and is essentially mutable. The derivation of the word in this sense is, acording to Augustine, from the Latin *subsistere*, and so = that which subsists of or by itself; Locke prefers to connect it with the Latin *substo* = to stand under, to support, to uphold, and says: "The idea, then, to which we give the name of substance, being nothing but the supposed but unknown support of these qualities (accidents) we find existing, which we imagine cannot subsist without something to support them, we call that support *substantia*, which, according to the true import of the word is in plain English (something) standing under and upholding."

The first idea of substance is probably derived from the consciousness of self — the conviction gained by experience that, while sensations, thoughts, and purposes are continually changing, the Ego constantly remains the same. Observation teaches us that bodies external to us remain the same as to quantity or extension, though their color and figure, their state of motion or of rest may be changed. But as every power and property of a thing, every mode in which it affects a sentient being, is an accident, and all these accidents may be either actually or mentally abstracted, the question arises, What is left after all the

accidents are thus abstracted? What is the substance? To meet the difficulty, it was assumed that everything possesses, besides its accidents, an unknown substratum on which these accidents rest, or in which they inhere. Locke, without departing from the knowable, placed the substance of an object in some essential or fundamental quality, the presence of which maintained, while its removal destroyed, the identity of the object, and Fichte made it consist in a synthesis of attributes; holding that these, synthetically united, gave substance, while substance analyzed gave attributes.

"When we speak of substance, we mean only what persists or abides in time, and we contrast the permanent with the changes of its phases. But the substance is not a separate thing over and above its modes or manifestations. It is simply that change or alteration cannot be understood except in reference to something permanent. It is easy, then, to say that substance is a fiction of thought. Kant's reply to that charge is, that to treat successive sensations as having one source common to them (what we must constantly do in our experience), implies, as a ground of its possibility, an identity or persistency in the consciousness which serves as the common vehicle of the successive feelings. Unless thought supplied this persistent, permanent background, it would be impossible for us to realize the relations in time known as succession and simultaneity."—Wallace, "Kant."

In theology, essence, nature, being. Used specially of the Three Persons in the Godhead, who are said to be the same in substance, *i. e.*, to have one common essence. Under this view God is an infinite and eternal substance, and at the same time a person, the great first cause and governor of the universe.

Substitution, the act of substituting or putting one person or thing in the place of another to serve the same purpose.

1. In algebra, the operation of putting one quantity in place of another, to which it is equal, but differently expressed.

2. In chemistry, a term denoting the replacing of one element or group of elements for another. It is the great agent, and covers nearly the whole field of chemical change, and is always attended with some alteration of properties in the compound, the alteration increasing with the amount of the substitution. (1) When chlorine replaces hydrogen in marsh gas, forming hydrochloric acid and methylic chloride, $CH_4 + Cl_2 = HCl + CH_3Cl$. (2) When an alcohol radical replaces chlorine, as in trichloride of phosphorus, $3Zn(C_2H_5)_2 + 2PCl_3 = 3ZnCl_2 + 2P(C_2H_5)_3$. (3) A basylous or chlorous radical is replaced one for the other, as when nitrate of silver is decomposed by chloride of sodium, $AgNo_3 + NaCl = NaNo_3 + AgCl$. (4) When hydrogen is replaced by an alcohol radical, as in the case of acting on ammonia with iodide of ethyl, $H_3N + C_2H_5I = HI + \left.\begin{matrix} C_2H_5 \\ H_2 \end{matrix}\right\} N$. See SALT.

3. In theology, the doctrine that in the crucifixion Christ was divinely substituted for, or took the place of, the elect, or of all mankind, obeying the law in their stead, suffering the penalty, expiating their sins, and procuring for them salvation. Used also of the principle involved in the bloody sacrifices of the Jewish economy (in which the animals were types of Christ), and in a still wider sense of the offering of the lower animals in the place of men, and of unbloody in the place of bloody sacrifices in certain of the ethnic religions. See SACRIFICE.

Subtraction, in arithmetic, the operation of finding the difference between one number and another, the less being subtracted from the greater. In algebra the operation is included under addition, the rule for subtraction being change the sign and add. Here there is no convention as to which quantity must be the greater; the algebraic sign of the remainder removes any possible ambiguity.

Subulicornia, or **Subulicornes,** in entomology, a tribe of *Neuroptera*, or, if that order be divided, of *Pseudoneuroptera*. It contains two families, *Ephemeridæ* and *Libellulidæ*, having a common character in the form of the antennæ which are short, awl-shaped, and composed of few joints. The group was founded by Latreille.

Subungulata, in zoölogy, a group or section of *Ungulata*, distinguished from true ungulates (*Ungulata vera*), by the structure of the carpus. The group embraces three sub-orders, *Hyraeoidea*, *Proboscidea*, and *Amblypoda*, all of which are in many classifications treated as orders. Among its members are, for example, the elephant (*q. v.*) and the hyrax (*q. v.*). The term *Ungulata polydaetyla* (or polydactyl-hoofed quadrupeds) has also been used.

Subways, a term generally applied to arched passages or small tunnels under streets for the purpose of containing gas pipes, water pipes, and sometimes sewer pipes, or at least drains for surface water. Some also contain telegraph wires and pipes for the transmission of compressed air. They are made of sufficient size to permit of workmen walking to and fro in them to examine the pipes and to execute repairs. They save the necessity for breaking up streets to get at the pipes for repairs, an operation which not only obstructs the traffic, but prevents the roadways and footpavements from being kept in proper condition. Paris has long had an extensive system of subways for the purposes above noted. These are built of stone, and are of various shapes, being circular, oval, or egg shaped, or with straight sides and semicircular top. The lower portions of them are stepped for footpaths, with a track for the drain between these. A number of these subways have been constructed

in London — in Southwark street, Queen Victoria street, and the Thames embankment, for example. The subway under the roadway of the Boulevard Sebastopol, one of the largest in Paris, is 16 feet wide and 11 feet high; that under the footway of the Thames embankment is 9 feet wide and 7 feet 3 inches high.

Another kind of subway comprises arched passages under railways to enable passengers to pass from one side to another of a station, or to communicate between two adjacent railway stations. In some cases these are elaborate examples of underground engineering. An extensive subway of this class was opened in London in 1900, between the Mansion House, the Bank of England, and the Royal Exchange.

The name subway is also applied to underground tunnels of city railways, such as those in use by several London electric lines, and in New York and Boston (see BOSTON, MUNICIPAL IMPROVEMENTS). The City and South London railway has two separate tunnels from 45 to 60 feet below the surface of the ground, each consisting of a cast-iron tube 10 feet in diameter, and formed of segments bolted together. At the stations there are hydraulic elevators as well as stairs. The stations of the Central London railways are at a depth of 60 to 90 feet below the surface.

The underground system of the New York Rapid Transit Subway was begun on March 24, 1900, and was opened to the public on Oct. 27, 1904. Its total cost was $40,000,000. Tunnel extensions are now (1907) being built under both the Hudson and East rivers, and 100 miles of new subways are planned. See BELMONT, AUGUST, and NEW YORK CITY—*Rapid Transit Tunnel.*

Succession, in music, the order in which the notes of a melody proceed. There are two sorts of succession, regular, or conjoint, and disjunct. A regular or conjoint succession is that in which the notes succeed each other in the order of the scale to which they belong, either ascending or descending. In a disjunct succession the melody is formed of intervals greater than a second. A sequence is sometimes spoken of as a succession, and passages of similar chords or progressions are described as a succession of thirds, fourths, fifths, sixths, sevenths, or octaves, as the case may be.

Acts of succession: In English history, the name given to several acts of Parliament, by which the succession to the crown was limited or modified. The first is an act of Henry IV., declaring Prince Henry heir-apparent to the thrones of England and France, with remainders to the other children of Henry IV. Other instances occurred in the case of Henry VII., and in regard to the successors of Henry VIII., and the rights of James I., Charles I., and Charles II. The most important is the act of settlement. (See SETTLEMENT, ACT OF).

Apostolic, or Apostolical succession: (See APOSTOLIC).

Geological succession of organic beings: The gradual disappearance of species, genera, families, etc., throughout the world as geological time goes forward, or the more rapid succession of one group of organisms to another within a limited area, as the adaptation of that area to particular forms of life changes, by water giving place to land, salt water to fresh, or the reverse. Within limited areas, however, the same type often persists from the later Tertiary to the present day; as in South America, where the sloth and armadillo have succeeded gigantic Edentates like the megatherium and glyptodon.

Law of succession: The law or rule according to which the succession to the property of deceased persons is regulated. In general this law obtains only in cases in which the deceased person has died intestate, or in which the power of bequeathing property by will is limited by the legislature. In England primogeniture is the general rule in cases of real estate, the eldest son and his issue taking the whole of the freehold estate; and, failing such stock, the next eldest son, and so on. This rule is however, subject to dower — generally one-third to the widow of the intestate. When males fail the daughters succeed, but they take, not in order of seniority, but altogether. When there is no lineal descendant the nearest lineal ancestor succeeds. In regard to movable property no right of primogeniture nor preference of males over females is recognized, the property being divided in equal proportions among the children or, failing them, the nearest kinsmen of the deceased, without respect to sex or seniority. In the United States each State has its own law of succession. Usually succession is by stirpes or root.

Succession Wars, the general name given to contests which took place in Europe during the 18th century on the extinction of certain dynasties or ruling houses. Four such wars are usually enumerated — that of the Spanish succession (1701–1713), of the Polish succession (1733–1738), of the Austrian succession (1740–1748), and of the Bavarian succession (1777–1779). The first and third alone are of sufficient general historical interest to be noticed here.

(1) *War of the Spanish Succession.*— Charles II., king of Spain, having died without direct descendants in November, 1700, claims were raised to the vacant throne by the husbands of his two sisters, Louis XIV., of France, who had married the elder, and the Emperor Leopold I., who had married the younger. Both these monarchs were

Succession Wars

also themselves grandsons of Philip III., of Spain; but neither desired the Spanish crown for his own head. Louis put forward his grandson Philip of Anjou; while Leopold advocated the claims of his second son, the Archduke Charles. The electoral prince Joseph of Bavaria, grandson of the Emperor Leopold, was the heir originally designated in King Charles's will, but he died in the beginning of 1699. Both Louis XIV. and his wife had nine years before solemnly renounced the crown of Spain for themselves and their heirs; nevertheless, after Joseph of Bavaria died the agent of Louis XIV. induced Charles of Spain to nominate Philip of Anjou as his successor. Three months after the Spanish monarch's death the French prince entered Madrid, and was crowned as Philip V.; and his accession was at first recognized by all the European powers except the emperor. Louis, however, soon provoked the United Netherlands and England, and they joined Austria for the purpose of armed opposition to France.

Hostilities were begun by Prince Eugene in Italy in 1701; and in the following year the conflict raged not only in Italy but also in the Netherlands and in Swabia. At first the allies were victorious all along the line: Marlborough took the fortresses on the Meuse and overran the electorate of Cologne; and the Landgrave of Baden had the good fortune to drive back the most redoubtable of the French commanders, Villars, who had crossed the Rhine from Alsace. But the aspect of things was altered in 1703 by Villars, who in conjunction with the Elector of Bavaria, penetrated as far as Tyrol and captured Passau, while the imperialists in Italy were more than held in check by Vendôme. But in the campaign of 1704 Marlborough and Eugene, acting in concert, inflicted a crushing defeat on their opponents at Blenheim and drove them back to France. Two years later the forces of Louis were compelled to withdraw from the Netherlands owing to Marlborough's great victory of Ramillies and his capture of the principal Flemish towns. At the same time Eugene and his relative the Duke of Savoy routed the French near Turin and swept them out of North Italy. Meanwhile the war had extended to the Iberian peninsula. The King of Portugal declared for the allies, and Archduke Charles made himself master of Catalonia, and even for a time held possession of Madrid. The English captured Gibraltar in 1704; but they and the Portuguese sustained a severe defeat from the Duke of Berwick (commanding the French forces) at Almanza in 1707. In this latter year Louis, feeling the severity of the strain, opened negotiations for a settlement. But the allies, having the upper hand, thought to humble him yet more, and the war went on.

An attempt of Vendôme and the Duke of Burgundy to reconquer the Spanish Netherlands in 1708 was frustrated by Marlborough and Eugene, who routed them at Oudenarde; and in the next year they defeated at Malplaquet the hitherto invincible Villars. Yet just when the fortunes of Louis seemed to be at their worst, circumstances intervened in his favor. In England the Whigs were supplanted by the Tories, who voted for peace; and in Austria the Emperor Leopold died and was succeeded by the Archduke Charles. Accordingly the war languished, and, Philip V. having pledged himself that the crowns of Spain and France should not be united, all the allies, except the emperor, signed the treaty of Utrecht on April 11, 1713. The emperor, too, was brought to terms after Villars had overrun the Palatinate and Baden, and he signed peace at Rastatt (March 7 1714), whereby he acknowledged Philip as king of Spain, and became himself the ruler of the Spanish Netherlands, Naples, Milan, and Sardinia.

(2) *War of the Austrian Succession.*—The Emperor Charles VI. died in 1740, leaving his hereditary dominions — Bohemia, Hungary, and the archduchy of Austria — to his daughter Maria Theresa. She was at once beset by enemies eager to profit from the presumed weakness of a feminine ruler. The Elector Charles Albert of Bavaria, who had refused his signature to the Pragmatic Sanction (*q.v.*), demanded the imperial crown as the descendant of the Emperor Ferdinand I., and he was backed up by France and Spain. Augustus of Saxony and Poland advanced his claim as being the husband of the eldest daughter of the Emperor Joseph I. Frederick the Great of Prussia seized the opportunity to wrest Silesia, which he greatly coveted, from the crown of Austria. The Bavarians and the French (under Belleisle) invaded Bohemia, and crowned the elector king of that country at Prague on Dec. 19, 1741. About two months later he assumed the imperial crown at Frankfort-on-Main; yet on the very next day his own capital (Munich) was occupied by the Austrian general Khevenhüller. who, assisted by the high-spirited Hungarians, had advanced up the Danube, and now speedily overran Bavaria. A few months later the empress-queen bought off her most dangerous antagonist, Frederick, by giving up to him Silesia. At this time too, Augustus of Saxony, who had at first made common cause with the French and the Bavarians, withdrew from the contest and made peace with Maria Theresa. In the end of 1742 the Austrians were forced out of Bavaria and the French evacuated Bohemia. The English, who from the first

paid a substantial subsidy to Austria, took up arms on her behalf in this same year, and in 1743 defeated the French at Dettingen in Bavaria. In this year the Austrians repossessed themselves of the Elector Charles Albert's dominions. Saxony now joined the allies and took the field against his former associates. On the other hand, Frederick renewed hostilities and invaded Bohemia; but after a short interval he was once more willing to make peace. About this juncture Charles Albert died, and his son and successor abandoned his father's pretensions to Maria Theresa's dominions. This left France to carry on the struggle alone. But while Austria had the better of the war in Italy, Marshal Saxe captured several of the Flemish fortresses, won the victories of Fontenoy (1745), Rocoux (1746), and Lawfeldt (1747), and reduced the Austrian (formerly Spanish) Netherlands. Peace was at length concluded at Aix-la-Chapelle on Oct. 18, 1748, things remaining pretty much *in statu quo*, except that Frederick was allowed to retain Silesia.

Succinamic Acid, $C_2H_4 < \begin{matrix} CO(H_2N) \\ COHO \end{matrix}$. Its barium salt is obtained by leaving a solution of succinimide and barium hydrate in equivalent proportions to evaporate over oil of vitriol and recrystallizing several times from weak alcohol. By decomposing with sulphuric acid, impure crystals of succinamic acid are obtained which soon decompose into succinate of ammonia.

Succinamide, $C_2H_4 < \begin{matrix} CO(H_2N) \\ CO(H_2N) \end{matrix}$, obtained by mixing ethylic succinate with strong aqueous ammonia. It forms small white crystals, soluble in boiling water, nearly insoluble in cold water, alcohol, and ether.

Succinanil, in chemistry, $C_4H_4O_2(C_6H_5)N$, obtained by heating pulverized succinic acid with dry aniline, and then dissolving it out with boiling water. It crystallizes from alcohol in fine interlaced needles sublimable without decomposition. It is insoluble in cold water.

Succinanilic Acid, $C_2H_4 < \begin{matrix} CO(C_6H_5HN) \\ COHO \end{matrix}$ prepared by dissolving succinanil in dilute ammonia and alcohol, boiling for a time, and neutralizing with nitric acid. It forms elongated laminæ, very slightly soluble in cold water, more soluble in hot water; melts when heated to 100°, and at a higher temperature decomposes into phenyl succinimide.

Succinate of Ammonia, $C_2H_4 < \begin{matrix} CO(H_4N)O \\ CO(H_4N)O \end{matrix}$ obtained by supersaturating succinic acid with ammonia, and leaving it to evaporate over quicklime. It crystallizes in hexagonal prisms; sp. gr., 1.367; very soluble in water and alcohol.

Succincti, in entomology, girted; a term applied to the chrysalids of the *Papilionidæ*, which are not only attached by the tail, but also supported by a belt of silk passing round the middle of the body and fixed firmly on each side.

Succinea, in zoölogy, the amber snail, a genus of *Helicidæ*, with 155 recent speeces, universally distributed. Shell imperforate, thin, ovate or oblong; spine small, aperture large; columella and peristome simple, acute; animal large, with short thick tentacles and broad foot; lingual teeth like helix. These snails inhabit damp places, but rarely enter the water.

Succinellite, a name given by Dana to an orthorhombic mineral substance obtained from amber by distillation; hardness, 1.0; sp. gr., 1.55; luster, vitreous; colorless or white; odor, aromatic; soluble in water. Composition: Carbon, 40.7; hydrogen, 5.1; oxygen, 54.2 = 100.

Succinic Acid, in chemistry, $C_4H_6O_4 = C_2H_4 \begin{cases} COHO \\ COHO \end{cases}$; volatile salt of amber; a dibasic acid belonging to the oxalic series, first recognized by Agricola in 1657. It occurs ready formed in amber, in certain plants, and in many animal fluids, and is a product of the oxidation of fatty acids of high molecular weight, and of the alcoholic fermentation of sugar. It is prepared by bringing calcium malate in contact with one-twelfth of its weight of decayed cheese, suspended in three parts of water, and kept for some days at a temperature of 30° to 40°. Succinate of lime is formed, which is collected on a filter, decomposed with sulphuric acid, purified by recrystallization. It crystallizes in monoclinic prisms, is readily soluble in water, less easily in alcohol, insoluble in ether, melts at 180°, and boils at 235°. It forms neutral and acid salts, those of the alkalies being very soluble in water. A characteristic reaction of succinic acid and soluble succinates is the formation of a red brown precipitate with ferric salts.

Succinic Anhydride, $C_2H_4 \begin{matrix} CO \\ CO \end{matrix} > O$; obtained by distilling **succinic acid** once or twice with phosphoric anhydride. It is a white mass, soluble in boiling absolute alcohol, and deposited from the solution in needles on cooling, insoluble in ether. Melts at 119.6°.

Succinic Chloride, $C_2H_4 < \begin{matrix} COCl \\ COCl \end{matrix}$; produced by distilling succinic anhydride with phosphoric pentachloride. It is a fuming, strongly refracting

liquid, boils at 190°, and with water yields succinic acid.

Succinic Ethers, compounds of succinic acid with alcohol radicals. Ethylic succinate $= C_2H_4 < \begin{matrix} CO(C_2H_5)O \\ CO(C_2H_5)O \end{matrix}$; is prepared by distilling 10 parts succinic acid, 20 parts alcohol, and 5 parts strong hydrochloric acid, and purifying the product by distillation over lead oxide. It is an oil, boiling at 214°; sp. gr., 1.036, slightly soluble in water. Methylic succinate $= C_2H_4 < \begin{matrix} CO(CH_3)O \\ CO(CH_3)O \end{matrix}$ is similarly prepared. It forms a crystalline mass, dissolves in alcohol and ether, boils at 198°, melts at 20°, the liquid having a sp. gr. of 1.179.

Succinimide, in chemistry, $C_2H_4 < \begin{matrix} CO \\ COHN \end{matrix}$; formed by the action of dry ammonia gas on succinic anhydride. It is obtained in large transparent crystals, which melt at 125–126°, sublime without alteration, and are easily soluble in water and alcohol.

Succulentæ, in botany, the 46th order in Linnæus' natural system. Genera: *Cactus, Mesembryanthemum, Sedum, Oxalis, Fagonia,* etc.

Succulent Plants, a general name for those flowering plants that are naturally very cellular and juicy. Most of such belong to what is called the *Xerophilous* group — *i. e.,* plants that can thrive in climates in which the air contains habitually very little moisture. To flourish under these circumstances the concomitants are various. In dicotyledons: (1) The leaves becoming thick and fleshy, with inner and leathery outer layers, in which the air passages and stomata are few, and the cells either small or their walls thickened by secondary deposits of cellulose, as shown in *Mesembryanthemum, Sedum, Cotyledon,* and *Sempervivum.* (2) The stem condensed into a single, central, unbranched, barrel-shaped or top-shaped mass, which is leafless and armed only with spines, as in *Echinocactus, Mammillaria,* and various *Euphorbiæ,* or without spines and bearing fleshy or rigid leaves, as in *Cycads, Welwitschia,* and some species of *Vitis.* (3) Branching fleshy stems which put on a somewhat leafy appearance, but without proper leaves, as in *Opuntia* and *Phyllocactus.* In monocotyledons we have two characteristic forms: (1) The large, thick, fleshy-leaved type, as illustrated by *Aloe, Gasteria, Fourcroya, Agave,* and *Bulbine.* (2) The familiar bulb type, as hyacinths, lilies, etc., which push up a flower in a brief season of fertility, and spend the rest of the year in the form of an underground mass of dry or fleshy leaf scales. The object of cultivation is frequently to develop cellulose tissue, thereby imparting succulency. Of this we have examples in many of the edible fruits, and in such garden plants as the celery, the lettuce, the turnip, and the carrot, the originals of which are hard, stringy, and worthless for food purposes.

Suchau, previous to the Taiping rebellion, one of the largest cities in China; on the Imperial canal, 80 miles W. N. W. of Shanghai, in the province of Kiangsu. It stands on numerous islands separated by canals, and since 1896 has been accessible as a treaty port. The city walls have a circuit of 10 miles. Suchau has for generations been a noted center of the silk manufacture and of the printing of cheap Chinese classics. It was captured by the Taipings, but recovered by "Chinese" Gordon in 1863, on which occasion the city with its many handsome buildings was almost wholly destroyed. Pop. (1898) 500,000.

Suchet (sü-shā'), **Louis Gabriel, Duke of Albuféra,** a French military officer; born in Lyons, France, March 2, 1770; entered the military service at an early age (1790), and served with distinction under Napoleon, Masséna, Joubert, and Moreau in the Italian and Swiss campaigns. He attained the rank of lieutenant-general before he was 30, and in 1808 received the command of a division in Spain, and was almost constantly victorious till after the battle of Vittoria. His brilliant services in that country obtained him the marshal's staff, and the title of duke. After the restoration Suchet was created peer of France. He lost his peerage after the battle of Waterloo, but recovered it in 1819. He died in Marseilles, France, Jan. 3, 1826.

Sucker, or **Sucking Fish,** a name applied popularly to the *Remora,* to the lumpsucker, and also to the fishes belonging to the teleostean genus *Liparis* which is nearly allied to the lumpsuckers. The best-known forms are Montague's sucker, *L. Montagui,* and the common sucker or sea-snail, *L. vulgaris,* which adheres to stones and other fixed objects by means of their united ventral fins. They are small fishes, three or four inches long.

Sucker State, a popular name for Illinois, whose inhabitants are pretty generally dubbed "suckers" by their fellow citizens of neighboring States. The following is the origin of the epithet: A writer in the "Providence Journal" says: "The western prairies are full of the holes made by the crayfish, which burrows to reach the water beneath the soil. In the early days of the country's settlement travelers armed themselves with slender hollow reeds, which they thrust, when thirsty, into these natural reservoirs, and thus easily supplied their longings by sucking the water through the reed or pipe."

Suckling, Sir John, an English author; born in Whitton, Middlesex, England, in 1609, and educated at Trinity College, Cambridge. In 1631–1632 he served as a volunteer under Gustavus Adolphus. In 1639 he equipped a troop of horse for the service of Charles I. against the Scotch. Being implicated in a plot to rescue the Earl of Strafford from the Tower, he was obliged to flee to France in 1640. His writings consist of letters; miscellaneous poems, including ballads and songs; a prose treatise entitled "An Account of Religion by Reason"; and several plays — "Aglaura," "The Goblins," "Brennoralt" — which were probably the first plays produced with stage scenery on an elaborate scale. He died in Paris in 1642.

SIR JOHN SUCKLING.

Sucre. See CHUQUISACA.

Sucre (sö'krā), **Antonio José de,** a South American military officer; born in Cumana, Venezuela, Feb. 3, 1793. He engaged in the rising against Spain in 1811, attained the rank of Brigadier-General in 1819, and in 1822 won the decisive victory of Pichincha, which forced the Spaniards to evacuate Quito. In 1824 he routed the Spanish forces at Ayacucho, thus liberating Upper Peru which was turned into a republic called Bolivia, of which Sucre was elected president in 1826. An insurrection broke out in 1828, and Sucre was driven from the country, but returned at the head of a Colombian army and reinstated himself. He was assassinated near Pasto, Colombia, June 4, 1830.

Suctoria, a name given by different authors to various groups of animals, from the fact that the mouth is more or less developed into a suctorial rather than a masticatory organ; especially the *Aphaniptera;* and a group of *Annelida,* containing the leeches.

Sudamina, minute transparent vesicles arising on the skin toward the favorable termination of various diseases which have been attended by perspiration, as acute rheumatism, typhus, scarlatina, enteric fever, etc.; developed chiefly on the front of the abdomen and the chest. They are smaller than miliary vesicles, which are opaque, instead of transparent. They are placed under the order *Vesiculæ.*

Sudan, the Arab name given to the vast extent of country in Central Africa which lies between the Sahara on the N., Abyssinia and the Red Sea on the E., the countries draining to the Kongo basin on the S., and Senegambia on the W. Its area is estimated at 2,000,000 square miles. The inhabitants comprise numerous nations of different races, chiefly the Negro, together with Arab colonists and traders. Western and Central Sudan are divided into a number of independent and semi-independent States: Bambarra, Gando, Sokoto, Adamawa, Bornu, Baghirmi, Wadai, and Kanem. These States have been absorbed into provinces formed by the European powers. French Sudan extends from Algeria and Tunis on the N. to Nigeria (British territory) on the S. and from the West coast "hinterlands" (French territory), to a line running from the extreme S. point of Tripoli to Lake Tchad. The boundary lines were fixed by the Anglo-French agreement of 1899. In the same year the administration of French Sudan was changed, the regions in the W. and S. W. being put under the control of the Governor-General of West Africa, while the regions in the N. and N. E. were made into two military departments. Pop. about 2,500,000. See SENEGAL.

The Egyptian or Eastern Sudan comprises Dongola, Khartum, Suakin, Senaar, Kordofan, Darfur, and the Equatorial Province, with Fazogli and Bahr-el-Chazal. The estimated area is about 950,000 square miles. Egyptian rule was first extended to the Eastern Sudan in the early part of the 19th century by Mohammed Ali, under whom Ibrahim Pasha carried it as far S. as Kordofan and Senaar. An Egyptian expedition under Sir Samuel Baker in 1870 led to the conquest of the equatorial regions on the Nile farther S. than the Sudan proper, of which General Gordon was appointed Governor-General in 1874. On the fall of Ismail Pasha of Egypt, Gordon was recalled, and hordes of Turks, Circassians, and Bashi-Bazouks were let loose to plunder the Sudanese. Egyptian misrule then became intolerable, and in this crisis appeared Mohammed Ahmed of Dongola, who gave himself out to be the Mahdi, the long-expected redeemer of Islam.

The revolt of the Mahdi broke up the Egyptian Sudan into various districts. After the Mahdi's death the insurrection was continued by one of his lieutenants called the Kalifa. In 1897 the Anglo-Egyptian army commenced operations for the recovery of the lost provinces. In 1898 the territory was practically regained, and the last resistance disappeared when Osman Digna was captured Jan. 19, 1900. By the convention of Jan. 19, 1899, the Egyptian Sudan is administered by a governor-general appointed by Egypt with the assent of Great Britain.

The receipts to be collected in the Sudan were estimated at $790,000, and the expenditures at $2,875,000, the balance to be made up by Egypt. In 1898, there were strained relations between the Egyptian and the French governments, owing to the presence in the Egyptian Sudan of a French force under Major Marchand. The difficulty was settled by Marchand's evacuation of Fashoda, and by the delimitation of the respective "spheres of influence" of the two governments, with a mutual agreement not to acquire territory or political influence beyond the designated boundary. Khartum is the capital of the Egyptian Sudan. Estimated pop. of the region, before the Mahdi's revolt, about 10,000.

Sudermann, Hermann (sö'der-man), a German author; born in Prussia, Sept. 30, 1857. He published: "In the Twilight" (1885); "Dame Care" (1886); "Brothers and Sisters" (1887); "Honor," better known as "Magda" (1888); "The Cat Bridge" (1889); "The Destruction of Sodom" (1890); "Home"; "Battle of the Butterflies"; "Iolanthe's Wedding" (1892); "Once on a Time" (1893); "Luck in the Corner" (1895); "About to Die" (1896); "The Three Heron Feathers" (1897); "Johannes" (1897); etc.

HERMANN SUDERMANN.

Sudeten Gebirge, a range of mountains in Germany running N. W. and S. E. for 120 miles, and separating Bohemia and Moravia from Saxony and Silesia. It comprises numerous diversified mountain masses which can only be roughly classified. (1) The S. E. portion — Sudeten proper, or Gesenke — extending from the Upper Oder to the sources of the March, and comprised wholly within Moravia and Austrian Silesia. The highest summit of this portion is Altvater (4,880 feet high). (2) The Glatzer-Gebirgsland, including the Schneeberg Reichensteiner-Gebirge, Eulen-Zobten, Habelschwerter, Erlitzer-Gebirge, and the Friedländer and Waldenburgher Highlands. (3) The district of the Riesen-Gebirge, Iser-Gebirge, and Lausitzer-Gebirge, with their spurs diverging into Schlesien. This part contains Schneekoppe, the culminating point of the whole range. The rocks of the Sudeten mountains, which are very varied, consist mainly of granite and schist, chalk and sandstone. They are rich in iron, copper, and zinc ores, and contain a little of the precious metals.

Sudetic Mountains, an extensive mountain system in the S. E. of Germany, dividing Prussian Silesia and Lusatia from Bohemia and Moravia, and connecting the Carpathians with the mountains of Franconia. It does not form a continuous chain except in the middle, where it is known under the names of Riesengebirge and Isergebirge. The subsidiary chains range on an average from 2,500 to 3,300 feet in altitude.

Sudoriferous Glands, glands which secrete or excrete perspiration; sweat glands. They are found in varying numbers, in most parts of the skin. Each gland consists of a long tube coiled into a knot near the closed end, which is situated in the cutaneous cellular tissue and constitutes the gland proper; and a straight, undulate, or spiral duct traversing the skin perpendicularly, to terminate on its surface between the papillæ. Krause estimated that nearly 2,800 exist on a square inch of the palm of the hand, and 400 to 600 on an equal space of the back and lower limbs. Called also sudoriparous glands.

Sue (sü), **Marie Joseph Eugène,** a French novelist; born in Paris Dec. 10, 1804. He adopted his father's profession of medicine, became a surgeon in the army, and served in Spain in 1823. In 1825 he joined the naval service, and in the capacity of surgeon was present at the battle of Navarino in 1827. On his father's death in 1829, he inherited an immense fortune, and, having abandoned his profession, he devoted himself to literary composition. His first work was a sea novel entitled "Kernock the Pirate," which was quickly followed by "Plick and Plock," "Atar-Gull," "The Salamander" and the "Lookout of Koatven." Among his first historical novels were "Latreaumont," "Jean Cavalier," and "The Commander." His most famous works are: "The Mysteries of Paris," and "The Wandering Jew." He wrote also: "Arthur"; "Hotel Lambert"; "Mathilde, or the Recollections of a Young Woman"; "The Foundling"; "The Seven Capital Sins"; and "The Mysteries of the

EUGÈNE SUE.

People." In 1850 he was elected to the Constituent Assembly, and sat as an advaneed radical. After the coup d'état by Napoleon III. in 1851 he left Franee and retired to Savoy. He died in Annecy, Savoy, July 3, 1857.

Sueira. See MOGADOR.

Suet, the solid fat deposited round the loins and kidneys of the ox or sheep, the latter being the more solid, and eontaining more stearin than beef fat, but less palmatin. Both eontain a little olein. When rendered down it forms TALLOW (*q. v.*). Chopped suet is used in eooking for making boiled puddings, and for various other purposes, as stuffing, ete. Mutton fat melts at 50° and beef fat at 47°. If melted and put over potted meat, it exeludes the air and retards deeay. It has been employed by botanists to preserve the fleshy fungi by permeating their pores. In pharmaey it is employed as an emollient in the preparation of eertain ointments and plasters, or as an addition to poultiees.

Suetonius Tranquillus, Caius, a Roman author; lived and wrote between A. D. 75 and 160. His father was Suetonius Lenis, a tribune of the 13th legion under Otho. The son mainly known to us as a biographer and miseellaneous writer was edueated for the Roman bar. He seems never to have sought publie employment, and even when he was offered the post of military tribune, he requested his friend Pliny to seeure it for a relative. Pliny speaks in high terms of his writings, extols his integrity and learning, and says the more he knew him the more he liked him. Suetonius was married, but, so far as is known, had no ehildren. Nevertheless he obtained, through Pliny's interest, from the Emperor Trajan the *jus trium liberorum*, a distinguished privilege and attainable in such case only by great interest. Suetonius filled the offiee of Magister Epistolarum to Hadrian, a position whieh gave him vast opportunities for seeing and utilizing many important imperial doeuments. The date of his death is unknown. He was a voluminous writer. His works, in part enumerated by Suidas, eonsisted of grammatieal treatises and works antiquarian, legal, moral, and biographieal, most of whieh have been lost. His "Lives of the Twelve Cæsars," "Lives of Eminent Grammarians," and a portion of "Lives of Eminent Rhetorieians," survive. On the first his reputation rests. It is pregnant with interest, replete with eurious information and endless aneedote and seandal bearing on the imperial eoterie — a perfect storehouse, in faet, of details of the profligacy and lust of the Cæsar family, set forth with all the sineerity, impartiality, and relish of an areh gossip. Yet withal there is no reason to doubt his veracity. As a writer his language is brief and precise, oeeasionally obscure, but without affectation. The fact of the younger Pliny's steadfast friendship for him is a strong point in his favor, both as a man and as an author. His "Lives of the Cæsars" still maintains the reputation in which it has been held for centuries. Editions of Suetonius are very numerous. The two earliest were published at Rome, 1470, a third at Venice, 1471. The editions of Burmann (1736, quarto, 2 vols.), of J. A. Ernesti (1748), and of Fr. Oudendorp (1751), are well known. The reeension by C. L. Roth (1858) deserves espeeial mention.

Suevi, an appellation of various Germanie tribes in elassie authors; used somewhat loosely, as we find it employed to designate peoples widely removed from eaeh other. On six different oeeasions tribes, probably Germanie, though possibly mixed with Celtie and Slavonie elements, appear in history under this name. (1) Cæsar mentions Suevi living on the E. bank of the Rhine, and possessing 100 villages. (2) Taeitus plaees them N. and S. of this, on both sides of the Upper and Middle Elbe. (3) In the 2d and 3d eenturies they appear along with the Quadi and Mareomanni in Moravia and Bohemia. (4) In 406 Suevi eross the Rhine along with the Vandals and Alans, and break into Spain, settling more espeeially in Leon and Castile, whence they were driven by the Visigoths in 584. (5) In 420 another tribe ealled Suevi are spoken of in Upper Germany, who left their name to the modern Swabia. (6) In the 6th eentury we hear of Nordsuevi, with a village Swevon on the Upper Elbe.

Suez, a town, on an angle of land near the N. extremity of the Gulf of Suez, and near the S. terminus of the Suez eanal. It is walled on all sides but that toward the sea, has an indifferent harbor, but a tolerably good quay. It is divided into an Arab quarter and a European quarter, the latter eontaining the buildings of the Peninsular and Oriental Steamship Co. Sinee the opening of the Suez eanal, the town has greatly improved, and a railroad eonneets it with Cairo.

The Gulf of Suez is the W. and larger of the two branehes into whieh the Red Sea divides toward its N. extremity, and washes the E. coasts of Egypt on the W. of the Sinaitic peninsula. Extreme length 200 miles, average width about 20 miles.

The Isthmus of Suez is a neek of land 72 miles wide at its narrowest part, extending from the Gulf of Suez on the S. to the Mediterranean on the N., and eonneeting the continents of Asia and Afriea. The main interest attaehed to this region, in reeent times, has been the cutting of a ship canal through the isthmus.

Suez Canal

Suez Canal. It is certain that in ancient times a canal connecting, indirectly, the Mediterranean and Red Seas did exist. At what period it was constructed is not so certain. Herodotus ascribes its projection and partial execution to Pharaoh Necho (about 600 years B. C.); Aristotle, Strabo, and Pliny fix on the half mythical Sesotris as its originator. The honor of its completion is assigned by some to Darius, King of Persia; by others to the Ptolemies. It began about a mile and a half from Suez, and was carried in a N. W. direction, through a remarkable series of natural depressions, to Bubastis, on the Pelusiac or E. branch of the Nile. Its entire length was 92 miles (of which upward of 60 were cut by human labor), its width from 108 to 165 feet, and its depth 15 (Pliny says 30) feet. How long it continued to be used we cannot tell, but at length it became choked up with sand, was restored by Trajan early in the 2d century A. D., but again became unusable from the same cause, and so remained till the conquest of Egypt by Amrou, the Arab general of the Caliph Omar, who caused it to be reopened, and named it the "Canal of the Prince of the Faithful," under which designation it continued to be employed for upward of a century, but was finally blocked up by the unconquerable sands, A. D. 767. In this condition it has ever since remained.

The attention of Europe was first turned to a canal here during the invasion of Egypt by Bonaparte, who caused the isthmus to be surveyed by a body of engineers, who arrived at the opinion that the level of the Mediterranean is 30 feet below that of the Red Sea at Suez — an opinion which a subsequent survey proved to be erroneous. From this time the question continued to be agitated at intervals, especially by the French, and various plans were proposed, but nothing definite was arrived at till 1847, when France, England, and Austria sent out a commission to measure accurately the levels of the two seas. The commissioners, M. Talabot, Robert Stephenson, and Signor Nigrelli, ascertained that instead of a difference of 30 feet the two seas have exactly the same mean level. The only noticeable difference was that there is a tide of 6½ feet at the one end and 1½ feet at the other. Another examination leading to similar results was made in 1853. Mr. Stephenson expressed himself very strongly against the feasibility of a canal, that is to say, a canal of such dimensions as would suit the requirements of modern commerce, and planned instead a railway from Cairo to Suez, which was opened (1858) and which now conveys overland the Indian and Australian mails. In 1854 a new experimenter appeared in the person of M. de Lesseps, a member of the French diplomatic service in Egypt, who (1856) obtained from the pasha the concession of building a ship canal from Tyneh (near the ruins of ancient Pelusium) to Suez. The peculiarity of M. de Lessep's plan lay in this, that instead of following an oblique course and uniting his canal with the Nile, as the ancients had done, and as all modern engineers had thought of doing, he proposed to cut a canal right through the isthmus in a straight line to Suez. The colossal feature of M. de Lessep's plan was the artificial harbors which he proposed to execute at the two ends. In 1855 a new European commission was appointed, which reported that M. de Lessep's scheme was practicable. The result of the report was the formation of a joint-stock

ROUTE OF THE SUEZ CANAL.

company, and the work was accordingly begun. The canal was to be dredged through Lake Menzaleh, which runs far into the land directly toward Suez, to be connected with Lake Temsah, the Bitter Lake, and other marshy swamps, and so with Suez. Only a third of the way required to be excavated through the sands and rocks

SUEZ CANAL -ENTRANCE OF CANAL, PORT TEWFIX.

of the desert. Work was begun in the end of 1860. Starting from Port Said, the eanal crosses about 20 miles of Menzaleh Lake. Through this lagoon it is 112 yards wide at the surface, 26 yards at the bottom, and 26 feet deep. An artificial bank rises 15 feet on eaeh side of this eanal. Beyond Menzaleh Lake heavier work begins. The distanee thenee to Abu Ballah Lake is 11 miles, with a height of ground above the level of the sea varying from 15 to 30 feet. Crossing the last named lake, there is another land distanee of 11 miles to Temsah Lake cutting through ground to a depth varying from 30 to 70 or 80 feet, and then 3 miles further aeross this little lake itself. At El Guisr, or Girsch, oeeurs the deepest cutting in the whole line, 85 feet below the surface. Ismailia, on Temsah Lake, is regarded as the eentral point of the eanal. The fresh-water eanal extends from the Nile to Temsah Lake, and was eonstructed purposely to supply with water the population aeeumulating at various points on the line of the eanal; but it is also used by small sailing vessels. On Nov. 16, 1869, the Suez canal was opened in form, with a procession of English and foreign steamers, in presenee of the Khedive, the Empress of the Freneh, the Emperor of Austria, the Crown Prinee of Prussia, and others.

For statisties of traffie and a comparison with other notable eanals, see SHIP CANAL.

Sufficient Reason, in philosophy, a term adopted from the following passage of Leibneitz's "Théodieée":

"Nothing is done without a sufficient reason; that is, nothing happens without its being possible to one knowing the causes of all things to render a reason which is sufficient why it is so, and not otherwise."

He defines the prineiple of suffieient reason, as that in virtue of whieh we know that no faet ean be found real, no proposition true, without a suffieient reason why it is in this way rather than in another. After stating that Arehimedes was obliged to take for granted that if there be a balanee in which everything is alike on both sides, and if equal weights are hung on the two ends of that balanee, the whole will be at rest, because no reason ean be given why one side should weigh down rather than the other, Leibnitz goes on to say:

"Now by this single principle of the sufficient reason may be demonstrated the being of a God, and all other parts of metaphysics or natural theology, and even, in some measure, those physical truths that are independent of mathematics, such as the dynamical principles or the principles of forces."

The prineiple of suffieient reason as a law of thought is usually stated by logieians thus: Every judgment we aecept must rest on a sufficient reason; and from this the following prineiples have been derived:

(1) Granting the reason, what follows from the reason must also be granted. On this syllogistic inference depends. (2) If all the consequents are held to be true, the reason must be true. (3) If the consequent is rejected, the reason must also be rejected. (4) If the consequent is admitted, we do not of necessity admit the reason, as there may be other reasons or causes of the same effect.

Mansel asserts that the principle of suffieient reason is not a law of thought, but only the statement that every aet of thought must be governed by some law.

The axiom of suffieient reason is that a judgment can be derived from another judgment (materially different from it), and finds in it its suffieient reason, only when the (logieal) eonnection of thoughts eorresponds to a (real) easual conneetion.

Suffrage, the right to vote for any purpose, but more espeeially the right of a person to vote in the election of his political representative. Many writers advoeate the universal extension of this right, but in Great Britain and most European eountries it is limited by a household or other qualifieation. In the United States it is praetieally universal for all male eitizens or naturalized persons of 21 years and upward.

The history of suffrage has been a record of progress and extension. The most limited form is observed in the first eleetion of the Virginia colony in 1607, and the most extensive today is in Wyoming. By the eharter granted to the Virginia Company the members of a eouncil of settlers, chosen by a higher couneil resident in England, were privileged to ehoose annually a president from their own number. In accordanee with this the first right of suffrage that existed in any permanent American colony was exereised by six members of the council, who, in May, 1607 chose Edward Maria Wingfield as the first president. In 1619 the different towns of Virginia eleeted by general suffrage, 22 burgesses, who, assembling at Jamestown, constituted the first legislative body eonvened in Ameriea. In the following year, a few hundred miles N. the Plymouth fathers gathered on the deck of the Mayflower and exereised a still more extended right of suffrage in the ehoiee of John Carver as the first governor of the colony. These privileges continued, with only a few changes in Virginia, till the Revolutionary War, excepting that 18 years after the election of Carver in Massaehusetts, their mass assemblies were deemed too large and a representative government was established.

Though democratie in principle, a few laws passed by the New England eolonists restrieted the privilege of suffrage. No person who had not beeome a freeman by taking the oath of allegiance was permitted to vote. No man, according to a law of 1631, was admitted to the freedom of the body politie who was not a member of some of the ehurches within the limits of the same. No Quaker was permitted to beeome a freeman. The two latter restrietions,

however, were soon removed. The power of the people was greatly increased through the results of the Revolution, yet in several of the original 13 States the right of suffrage was restricted to property holders or rate payers, and otherwise limited for periods extending in some cases through one or more decades of the past century. The tendency was constantly to the wide limits of manhood suffrage, which was then prevailing rule, but only as regards white citizens, till the 15th Amendment to the National Constitution in March, 1870, extended the same right to colored citizens. The movement toward the extension of the right to women has been successful in Wyoming, Colorado, Idaho, etc., and to a certain extent in Ohio and Massachusetts, which permit women to vote for members of the board of education. The agitation, also, of the educational qualification of electors has resulted in late years in a slight limitation of the right of suffrage in a few of the States, notably Massachusetts.

The following are the qualifications for voting in each State of the Union:

States.	Requirements as to Citizenship.	Previous Residence Required.				Persons Excluded from Suffrage.
		In State.	In County.	In Town.	In Precinct.	
Alabama*.	Citizen of United States or alien who has declared intention.	1 yr...	3 mo...	30 dys..	30 dys..	Convicted of treason or other felonies, idiots, or insane.
Arizona*.	Citizen of United States or alien who has declared intention (*a*).	1 yr...	30 dys.	30 dys..	30 dys..	Idiot, insane, felon.
Arkansas*.	Citizen of United States or alien who has declared intention.	1 yr...	6 mo...	30 dys..	30 dys..	Idiots, insane, convicted of felony, failure to pay poll tax, U. S. soldiers, or mariners.
California*	Citizen by nativity, naturalization (90 days prior to election), or treaty of Queretaro.	1 yr...	90 dys.	.....	30 dys..	Chinese, idiots, insane, embezzlers of public moneys, convicted of infamous crime.†
Colorado*.	Citizen or alien, male or female, who has declared intention four months prior to election.	6 mo...	90 dys.	.....	10 dys..	While confined in public prison, under guardianship, *non compos mentis,* insane.
Conn.*....	Citizen of United States who can read English language.	1 yr...	.....	6 mo...	.....	Convicted of heinous crime, unless pardoned.
Delaware*.	Citizen who shall have paid a registration fee of $1.	1 yr...	3 mo...	.....	30 dys..	Insane persons and paupers or persons convicted of felony.
Dis.of Col..	See foot note at end of tables.					
Florida*..	Citizen of the United States.	1 yr...	6 mo...	6 mo...	30 dys..	Idiots, duelists, convicted of felony or any infamous crime.
Georgia(*i*).	Citizen of the United States who has paid all his taxes since 1877.	1 yr...	6 mo...	.....	.....	Convicted of felony, bribery, or larceny, unless pardoned, idiots, and insane.
Idaho*....	Citizen of the United States, male or female.	6 mo..	30 dys..	3 mo...	.....	Idiots, insane, convicted of felony, bigamists, polygamists, under guardianship.
Illinois*...	Citizen of the United States.	1 yr...	90 dys	30 dys.	30 dys..	Convicted of felony of bribery in elections, unless restored to citizenship.
Indiana*..	Citizen or alien who has declared intention and resided one year in the United States.	6 mo..	60 dys..	60 dys..	30 dys..	United States soldiers, sailors, and marines, and persons convicted of infamous crime.
Iowa*.....	Citizen of the United States.	6 mo..	60 dys..	(*e*)	(*e*)	Idiots, insane convicted of infamous crime.
Kansas*...	Citizen of the United States or alien who has declared intention (*b*).	6 mo..	30 dys..	30 dys..	30 dys..	Convicted of treason or felony, insane, under guardianship (*d*).
Kent'ky*..	Citizen of the United States.	1 yr...	6 mo...	60 dys..	60 dys..	Convicted of treason, felony, or bribery, idiots, and insane.
Louisia'a*.	Citizen of the United States (*f*).	2 yrs..	1 yr..	.....	6 mo...	Idiots, insane, felons, under indictment, inmates of prison or charitable institution except Soldiers' Home.
Maine*....	Citizen of the United States.	3 mo...	3 mo...	3 mo...	3 mo...	Paupers and Indians not taxed.
Maryla'd*.	Citizen of the United States.	1 yr...	6 mo...	6 mo...	1 day...	Felons not pardoned, lunatics, persons *non compos mentis.*
Mass.*....	Citizen who can read and write (*b*).	1 yr...	6 mo...	6 mo...	6 mo...	Paupers and persons under guardianship.
Michigan*.	Citizen or alien who declared intention to become a citizen prior to May 8, 1892 (*b*).	6 mo..	20 dys..	20 dys..	20 dys..	Indians with tribal relations, duelists and accessories.

States.	Requirements as to Citizenship.	Previous Residence Required.				Persons Excluded from Suffrage.
		In State.	In County.	In Town.	In Precinct.	
Minn.*....	Citizen of the United States who has been such for 3 months preceding election.	6 mo..	30 dys..	30 dys..	30 dys..	Convicted of treason or felony, unpardoned, under guardianship, insane. Indians lacking customs of civilization.
Miss.*....	Citizen of the United States who can read or understand Constitution.	2 yrs..	1 yr...	1 yr...	1 yr(*c*)	Insane, idiots, Indians not taxed, felons, persons who have not paid taxes, bigamists.
Missouri*.	Citizen of United States or alien who has declared intention not less than 1 year or more than 5 before election.	1 yr...	60 dys..	60 dys..	60 dys..	Persons in poorhouses or asylums at public expense, those in prison, or convicted of infamous crimes (*g*).
Montana*.	Citizen of the United States (*b*).	1 yr...	30 dys..	30 dys..	30 dys..	Felons not pardoned, idiots, insane, United States soldiers, seamen, and marines, Indians.
Nebraska*.	Citizen of United States or alien who has declared intention 30 days before election.	6 mo..	40 dys..	10 dys..	10 dys.	Convicted of treason or felony, unless restored to civil rights, persons *non compos mentis* (*h*).
Nevada*..	Citizen of the United States.	6 mo..	30 dys..	30 dys..	30 dys..	Idiots, insane, unpardoned convicts, Indians, Chinese.

* Australian Ballot law or a modification of it in force. † Or a person unable to read the Constitution in English and to write his name. (*a*) Or citizens of Mexico who shall have elected to become citizens under the treaties of 1848 and 1854. Poll tax must be paid for current year. (*b*) Women can vote in school elections. (*c*) Clergymen are qualified after six months' residence in precinct. (*d*) Also public embezzlers, persons guilty of bribery, or dishonorably discharged soldiers from the United States service, unless reinstated. (*e*) Only actual residence required; in cities voter must reside in ward 10 days. (*f*) Those able to read and write, or who own $300 worth of property assessed in their name, or whose father or grandfather was entitled to vote on Jan. 1, 1867. (*g*) Also soldiers, sailors, and marines in the United States service. (*h*) No soldier, seaman, or marine deemed a resident because stationed in the State. (*i*) The Australian system sometimes prevails in municipal primaries in Georgia, but same is made applicable by rule of party ordering primary and not by law.

States.	Requirements as to Citizenship.	Previous Residence Required.				Persons Excluded from Suffrage.
		In State.	In County.	In Town.	In Precinct.	
N.Hamp.*.	Citizen of the United States (*a*).	6 mo...	6 mo.	6 mo...	6 mo..	Paupers (*h*).
N. Jersey*.	Citizen of the United States	1 yr...	5 mo...	.....	....	Idiots, paupers, insane, convicted of crime, unless pardoned or restored by law (*j*).
N. M.....	Citizen of the United States	6 mo...	3 mo...	30 dys.	30 dys..	Convicted of felony, unless pardoned, United States soldier, sailor, or camp follower, Indians.
N. York*.	Citizen who shall have been a citizen for 90 days prior to election. Woman otherwise qualified but for sex may vote at village elections to raise money by tax or assessment if she owns property in village affected.	1yr(*k*)	4 mo..	(*l*)	(*l*)	Offenders against the elective franchise right, being guilty of bribery, and betting on elections, and persons convicted of bribery, or of any infamous crime and not restored to citizenship by the Executive.
N. Car....	Citizen of the United States (*i*).	1yr(*i*)	90d.(*i*)	(*i*)	(*i*)	Convicted of felony or other infamous crime, idiots, lunatics (*i*).
N. Dak.*.	Citizen of the United States and civilized Indian.† (*a*).	1 yr...	4 mo...	.....	90 dys..	Under guardianship, persons *non compos mentis*, or convicted of felony and treason, unless restored to civil rights.
Ohio*.....	Citizen of the United States (*a*).	1 yr...	30 dys..	20 dys..	20 dys.	Idiots, insane, and felons, persons in United States military and naval service on duty in Ohio.
Okla.....	Citizen of the United States (*a*) †	6 mo...	60 dys..	60 dys..	30 dys..	Felons, idiots, insane.

States.	Requirements as to Citizenship.	Previous Residence Required.				Persons Excluded from Suffrage.
		In State.	In County.	In Town.	In Precinct.	
Oregon*...	Citizen of U. S. or alien who has declared intention more than 1 year prior to election (*a*).	6 mo...	None..	None..	None.	Idiots, insane, convicted of felony, Chinese.
Penna.*...	Citizen of the United States at least one month, and if 22 years old or more must have paid tax within two years.	1 yr...	.....	.....	2 mo...	Convicted of perjury and fraud as election officers, or bribery of voters.
Rhode I.*.	Citizen of the United States	2yr(*b*)	.....	6 mo...	.....	Paupers, lunatics (*g*).
S. Car....	Citizen of the United States (*e*).	2yr(*c*)	1 yr...	4 mo...	4 mo...	Felons, crimes against election laws, unless pardoned, idiots, insane, paupers.
S. Dak.*..	Citizen of the United States or alien who has declared intention, Indian who has severed tribal relations (*a*).	6 mo ||	30 dys..	10 dys..	10 dys..	Under guardianship, insane, convicted of treason or felony, unless pardoned, United States soldiers, seamen, and marines.
Tenn.*....	Citizen of the United States who has paid poll tax of preceding year.	1 yr..	6 mo...	.....	.....	Convicted of bribery or other infamous offense.
Texas*....	Citizen of the United States or alien who has declared intention six months prior to election.	1 yr...	6 mo...	.....	(*d*)	Idiots, lunatics, paupers, convicted of felony, United States soldiers, marines, and seamen.
Utah*.....	Citizen of the United States, male or female.	1 yr...	4 mo...	.....	60 dys.	Idiots, insane, convicted of treason or crime against elective franchise, unless pardoned.
Vermont*.	Citizen of the United States	1 yr...	.....	3 mo...	30 dys..	Those who have not obtained the approbation of the local board of civil authority.
Virginia*..	Citizen of the United States	1 yr...	3 mo...	3 mo...	30 dys..	Idiots, lunatics (*f*).
Wash'n*..	Citizen of the United States and all residents of Territory prior to Statehood (*a*).	1 yr...	90 dys..	30 dys..	30 dys..	Idiots, lunatics, convicted of infamous crimes, Indians not taxed.
West Va.*	Citizen of the State.....	1 yr...	60 dys..	.....	(*d*)	Paupers, idiots, lunatics, convicted of treason, felony, or bribery at elections.
Wis.*.....	Citizen of the United States or alien who has declared intention, and civilized Indians.† (*a*).	1 yr...	.....	10 dys..	10 dys..	Under guardianship, *non compos mentis,* insane, convicted of crime or treason, betting on elections.
Wyom.*...	Citizen of the United States, male or female.	1 yr...	60 dys..	10 dys..	10 dys..	Idiots, insane, felons, unable to read State Constitution in the English language.

* Australian Ballot law or a modification of it in force. † Indian must have severed tribal relations. || One year's residence in the United States prior to election required. (*a*) Women can vote in school elections. (*b*) Owners of real estate, one year. (*c*) Ministers in charge of an organized church and teachers of public schools are entitled to vote after six months' residence in the State. (*d*) Actual residence in the precinct or district required. (*e*) Who has paid six months before election any poll tax then due, and can read and write any section of the State Constitution, or can show that he owns and has paid all taxes due the previous year on property in the State assessed at $300 or more. (*f*) Or convicted of bribery at election, embezzlement of public funds, treason, felony, and petty larceny, duelists and abettors, unless pardoned by Legislature. (*g*) Or persons *non compos mentis,* convicted of bribery or infamous crime, till restored to right to vote, under guardianship. (*h*) Also persons excused from paying taxes at their own request. (*i*) On and after July 1, 1902; 2 years in State; 6 months in county; in precinct, ward, or election district 4 months. (*j*) No soldier, seaman, or marine deemed a resident because stationed in the State. (*k*) Inhabitance not residence. (*l*) Thirty days in election district.

Residents of the District of Columbia never had the right to vote therein for national, officers, or on other matters of national concern, after the territory embraced in it was ceded to the United States and became the seat of the general government. But from 1802 to June 20, 1874, the citizens of Washington, and from Jan. 1, 1790, to said date the citizens of Georgetown, were entitled to vote on municipal subjects and for certain municipal officers. The citizens of the portion of the District outside of Washington and Georgetown were entitled to the privilege of voting on municipal subjects from April 20, 1871, to June 20, 1874, but that suffrage was abolished in the District of Columbia, June 20, 1874, by an act of Congress of that date.

Suffrage, Woman. See WOMAN SUFFRAGE.

Suffren Saint-Tropes, Pierre André de, a French naval hero; born a younger son of a good Provence family July 17, 1729. At 14 he entered the navy, and first saw fire in the indecisive action with the English off Toulon in 1744. He took part in the unsuccessful attempt to recapture Cape Breton (1746); was captured by Hawke in the Bay of Biscay the next year; but soon exchanged; and after the peace went to Malta

and served for six years among the Knights Hospitallers. Again in the French service, he took part in the action off Minorca (May, 1756), was again captured in Boscawen's destruction of the Toulon fleet (1759), after the peace of 1763 cruised in the Mediterranean for the protection of trade, and took part in the bombardment of Sallee in 1765. Commander in 1767, he served four years in the service of Malta, and returned to France to the rank of captain in 1772. Early in 1777 he sailed to America, and his ship began the indecisive battle of Grenada on July 6, 1779. He next served with the allied fleet blockading Gibraltar, and early in 1781 was placed in command of a squadron of five ships for service in the East Indies. After an action at the Cape Verd Islands, he outsailed Commodore Johnstone to the Cape, and so saved the colony for the time. Sailing to Madras, he fought a hard but indecisive battle off Sadras, and soon after, in a bloody two days' battle off Providien on the coast of Ceylon, proved himself a consummate master of naval tactics. But he had to struggle against scurvy, want of supplies, and, still worse, the disaffection and cowardice of his senior officers. Having captured Trincomalee, he two days later stood out of the harbor with 15 ships against the English 12, and fought a hard but irregular battle. His last fight (June, 1783) was also indecisive. Suffren arrived in Paris early in 1784, and was received with the greatest honors, and created Vice-Admiral of France. Frenchmen give the Bailli de Suffren (he had been made Bailli of the Order of Malta) the most exaggerated praises, and Professor Laughton styles him "one of the most dangerous enemies the English fleets have ever met, and without exception the most illustrious officer that has ever held command in the French navy." He died suddenly in Paris Dec. 8, 1788, most probably of apoplexy, to which his extreme corpulence made him subject.

Sufism, the pantheistic mysticism of the Mohammedan East, which strives for the highest illumination of the mind, the most perfect calmness of the soul, and the union of it with God by an ascetic life and the subjugation of the appetites. This pantheism, clothed in a mystico-religious garb, has been professed since the 9th and 10th centuries by a sect which at present is gaining adherents continually among the more cultivated Mohammedans, particularly in Persia and India. The name is from *sufi*, a religious ascetic, an Eastern term applied to all members of religious monastic bodies leading an ascetic life. The Sufis were originally devout persons who, perplexed by the discord prevailing among the various systems of Mohammedan philosophy in the 2d century of the Hejira, found consolation in pious mysticism. Their teachings, though at first consonant with orthodox Mohammedanism, gradually led to a mode of thought totally irreconcilable with the Koran. About the beginning of the 10th century the Sufis divided into two branches, one of which followed Bostanie, who openly embraced pantheism, and the other Juneid, who sought to reconcile Sufism with Mohammedanism. Among eminent Persian poets belonging to the Sufis we may mention Hafiz, a distinguished Sufi; Ferîd-eddîn, and Jami. The celebrated philosopher and jurist, Alghazzâlî was also a Sufi.

Sugar, a sweet, crystallized substance manufactured from the expressed juice of various plants, especially from the sugar cane; also, any substance, more or less resembling sugar in any of its properties; as sugar of lead; figuratively, sweet, honeyed, or soothing words or flattery, used to disguise or hide something distasteful.

In chemistry, $Cn(OH_2)m$, the generic name for a large number of bodies occurring naturally in the animal or vegetable kingdom, or produced from glucosides by the action of ferments or dilute acids. They are all more or less soluble in water, and their solutions exert a rotatory action on polarized light. Some reduce alkaline solutions of copper while others either do not, or do so only to a limited extent. They may all be classed under two heads, viz., unfermentable sugars, as mannite, dulcite, sorbite, etc., and fermentable sugars, as cane sugar, glucose, maltose, etc. Cane sugar, $C_{12}H_{22}O_{11}$, called also saccharose, sucrose, and canose, is found in the juice of many grasses, in the sap of several trees, and in beet and several other roots. It appears to be the transition product between starch and invert sugar in all plants which yield the latter compounds. Walnuts, almonds and St. John's bread contain only cane sugar. It is extracted most easily from sugar cane, but on the Continent of Europe is manufactured on a large scale from beet root. The expressed juice is heated nearly to the boiling point, and a small quantity of slaked lime added. The clear liquid which separates from the coagulum is evaporated as rapidly as possible, and transferred into shallow vessels to crystallize. Drained from the syrup or molasses, it yields the raw sugar of commerce. When further refined by treatment with animal charcoal, poured into molds, and then dried in a stove, the product is loaf sugar. When the crystallization is allowed to proceed very slowly, sugar candy results. Moderately heated it melts, and solidifies on cooling to an amorphous mass, familiar as barley sugar. Pure sugar separates from its solution in transparent colorless crystals, having the figure of a modified monoclinic prism. It has a pure, sweet taste, and requires for solution only one-third of its weight of cold water. Its

crystals have a sp. gr. of 1.6. Heated above 210°, water is given off and a brown substance known as caramel remains. Cane sugar is transformed into invert sugar by boiling in presence of dilute acids, mineral acting more rapidly than organic acids. Strong sulphuric acid completely decomposes cane sugar, and nitric acid converts it into saccharic acid. It turns a ray of polarized light to the right, Aj = 73.8.

Sugar Cane, *Saccharum officinarum,* a strong, cane-stemmed grass, from 8 to 12 feet high, producing a large, feathery plume of flowers. It is wild or cultivated in the Southern United States, India, China, the South Sea Islands, the West Indies, and South America, flourishing in the zone or belt from the equator to 35° or 40° N. and S. The land chosen for its cultivation is usually a good loam or light clay well manured. The leafy ends of the canes of the preceding season are cut off, or the whole cane is cut up, each piece being made to contain two nodes or joints. Twenty thousand of these are planted on each acre in January and February, the harvest begins early in December, and the cutting and crushing of the canes are carried on till January or February. There are several varieties of the sugar cane.

It has been supposed that sugar cane was the "sweet cane from a far country" of Jeremiah (vi: 20; also Isa. xliii: 24). The scripture plant was, however, more probably *Andropogon calamus aromaticus.* According to Strabo, Nearchus, the admiral of Alexander the Great, describes a kind of honey (probably sugar) from an Indian reed, as did Theophrastus and other writers. Dioscorides uses the term *saccharum,* derived from the Indian name of the sugar cane. Europe seems indebted for the plant to the Saracens who introduced it into Rhodes, Cyprus, Sicily, Crete, and Spain, in the 9th century; the Crusaders in the 12th found it in Syria; the Spaniards and Portuguese carried it to the Canary Islands and Madeira early in the 15th. Thence, on the discovery of America, it was transported to the West Indies, where a large sugar industry speedily arose.

Sugar Loaf, The, a popular name given to a conical hill arising abruptly from the Hudson river at the N. entrance to the Highlands, about 57 miles from New York city.

Sugar Maple, the *Acer saccharinum,* an American tree, sometimes 80 feet high, largely prevailing in New Bruswick, Nova Scotia, part of the United States, etc. The leaves are cordate, very smooth, and glaucous beneath. They have five lobes, which are taper, pointed, and toothed, becoming red in the autumn. It is tapped in the spring for its juice, which yields sugar. See ACER.

Sugar Mill, a mill for expressing the juice from sugar canes. It has usually three rollers; two in the same horizontal plane, and the third over and between these. The canes are fed in between the upper and first horizontal rollers, where they receive their first squeeze, the juice running down into a trough at the base of the mill; they then travel onward, receiving a second squeeze between the top roller and the second horizontal roller.

Sugar Making, Profits in Beet. Careful estimates have been made as to the profits in beet sugar making, and one thing may be said in favor of these estimates, that the actual cost of manufacturing beet sugar has now been amply demonstrated in 30 different works. The "Beet Growers' Manual" gives the cost of manufacturing per ton of beets, with coal at $3 per ton and beets at $4 per ton, at $6.07. This is based on the actual cost of operating a number of plants. In Colorado the beets give a higher percentage of sugar, and as the price of beets is based on the percentage of sugar, the cost in Colorado has been about $5 per ton for the beets, and the cost of reduction and refining $1.10 per ton; cost of management, field superintendents, office expenses, etc., about 50 cents per ton, making a total cost of $6.60 per ton, while the recovery of sugar amounts to about $11 per ton, leaving a profit of about $4.40 per ton.

The New York "Evening Sun" states regarding prices, that the average cost of granulated sugar in New York during 1901 was $4.672 per 100 pounds; the average selling price $5.05, leaving a profit of 37.8 cents per 100 pounds. While the average cost of beet sugar in the Colorado and Utah factories in 1901 did not exceed $3.15 and the average selling price was $5.05, leaving a profit on beet granulated sugar of $1.90 per 100 pounds or about 40 per cent.

According to a special census report on MANUFACTURES (1905) there were 51 beet sugar factories in operation in the United States, and the combined value of their products was $24,393,794.

Sugar Production. There is produced in the world at the present time nearly 11,000,000 tons of sugar a year. In the United States, where the greater part of the sugar used is cane sugar, the fact that about two-thirds of the sugar produced in the world is made from the beet is hardly realized. The United States is in the cane belt, however, and it is therefore natural that it should use cane sugar when all Europe is using beet sugar. A glance at the following table will show where the cane sugar of the world comes from. The figures give the crop in tons of the year 1901–1902, as compared with that of 1900–1901, and are those compiled by the best American authorities:

Sugar Production

Country.	1901-02.	1900-01.
United States (Louisiana)....	300,000	275,000
Porto Rico	100,000	80,000
Hawaiian Islands	300,000	321,461
Cuba (crop)	875,000	635,000
Trinidad (exports)	50,000	50,000
Barbados (exports)	60,000	60,000
Jamaica	30,000	30,000
Antigua and St. Kitts.....	25,000	25,000
Guadaloupe	35,000	35,000
Martinique (exports)	32,000	32,000
St. Croix	13,000	13,000
Haiti and San Domingo.....	45,000	45,000
Lesser Antilles	8,000	8,000
Mexico (crop)	95,000	93,000
Guatemala (crop)	9,000	9,000
San Salvador (crop)	5,000	5,000
Nicaragua (crop)	3,500	3,500
Costa Rica (crop)	1,500	1,500
British Guiana (exports).....	95,000	95,000
Dutch Guiana (crop).....	6,000	6,000
Venezuela	3,000	3,000
Peru (exports)	105,000	105,000
Argentine Republic (crop)...	115,000	114,252
Brazil (crop)	215,000	190,000
Total in America.....	2,526,000	2,204,252
British India (exports).....	15,000	15,000
Siam (crop)	7,000	7,000
Java (crop)	725,000	710,120
Philippines (exports)	70,000	48,000
Total in Asia	817,000	780,120
Queensland	117,000	92,554
New South Wales.....	19,000	19,000
Fiji Islands (exports).....	33,000	33,000
Total Australia & Polynesia.	169,000	144,554
Egypt (crop)	95,000	94,880
Mauritius	180,000	175,267
Reunion	35,000	35,000
Total for Africa.....	310,000	305,147
Spain	33,000	33,000
Total cane sugar production..	3,855,000	3,502,390

In comparison with these figures are others showing the beet sugar production of Europe. The best European authorities place the total production for 1901–1902 at 6,710,000 tons. For this previous year it was 6,068,994 tons. The beet sugar crop of the United States adds 150,000 tons to this beet sugar total, making it 6,860,000 tons. These figures very strongly call attention to the wonderful growth of the beet sugar industry abroad. Of the cane sugar of the world the United States uses the greater part. In 1900 when the entire production of North, South, and Central Americas was 2,204,252 tons of cane sugar the consumption of sugar in the United States was 2,219,847 tons. The countries which use the largest amount of sugar are not the countries in which the greatest amount of sugar is produced. The great sugar producing country of Germany legislates sugar out of the mouths of its own people. Favored by legislation England becomes the great sugar consuming nation. The per capita consumption of sugar in England is 91.6 pounds per annum. After England comes the United States, with a per capita consumption of 66.6 pounds. Switzerland uses 60.3 pounds; Denmark, 54.8; Norway and Sweden, 38.2; France, 36.9; Germany, 33.9; Belgium, 23.3; Austria, 17.6; Holland, 14; Portugal, 14.7; Spain, 10.6; Turkey, 8; and Italy, 6.1 pounds.

Under normal conditions prior to the American-Spanish War, with labor abundant, the average cost of producing sugar in Cuba was believed to be about 2⅛ cents per pound, the cost ranging from 2⅜ cents on small plantations inland to 1⅞ cents at large factories on the sea coast. In 1902, under present conditions of scarce labor, increased taxes, and scantier yield from neglected and impoverished fields, the average cost of production was advanced to 2¼ cents a pound. The expense on one pound of Cuban centrifugal sugar, between the plantation factory in Cuba and the refinery in New York is: Transportation to seaboard, including railway freight, wharfage and lighterage is 60 cents per sack of 300 pounds, or .20 cents per pound; freight from Cuba to New York, .12 cents per pound; marine insurance (1 per cent., f. o. b. price), .02 cents; landing charges at New York, (.06 cents per sack) .02 cents; weighing and taring, .01 cents; lighterage to refinery, .04 cents; commission, etc., 2½ per cent. on 3¾ cents, .095 cents; duty in United States, 1.685 cents; loss in weight in transit, average 1 per cent., .02 cents. A total expense of 2.21 cents per pound. The gross market value in New York being 3¾ cents, the net price received by the producers is 1.54 cents per pound. The cost of production being 2¼ cents and the net proceeds 1.54 cents, there is a net loss of .71 cents per pound, or $14.20 per ton of 2,000 pounds, suffered by the producer, and a net loss of $14.20 per ton on 800,000 tons of sugar, the estimated crop of 1902 gives a prospective loss of $11,360,000. The amount of duty collected by the United States government on 800,000 tons of Cuban centrifugal sugar 96 per cent. test, at $33.70 per ton by the provisions of the law in force in 1902, was $26,960,000.

In contrast may be cited the position of the sugar planter in Porto Rico. For centrifugal sugar 96 degrees test the market price is only 3¾ cents and the expenses incurred in marketing the Porto Rican product in the United States is only .485 cents a pound, no duty being imposed, the net proceeds being 3.265 cents a pound or $34.50 a ton; against a net loss of $14.20 a ton on the Cuban product, a difference of $48.70 a ton. England is the one country that has thrown its doors open to the cheap sugar of the world. There is no tax on sugar in Great Britain except the war tax, and as a result sugar is cheaper in England than in any other country. The first result of this condition has been to kill off the sugar refining business in England. Wipe out the sugar bounties of Continental Europe, and the sugar refining business in England would

be a great industry. In place of this industry, however, other industries have sprung up in England, driven out of Europe by the high price of sugar, and assumed great importance. The fruit canning industry of Germany has been killed, for instance. Fruit is sent from Germany to England, preserved with German sugar, and then sent baek to Germany because the price of sugar in Germany prohibits the business. It has been elaimed that England has been a great gainer in an industrial way by cheap sugar, to say nothing of the great question of supplying all the people with a neeessary food product at a very eheap price. Great Britain has her eolonies to eonsider, however, and in 1902 there was a bitter fight in England on the question of sugar duties. See BEET SUGAR.

Suggestion, in ordinary language, the presentation of an idea to the mind; or the idea presented; as the suggestions of faney of imagination. In suggestive therapeutics, any means, such as thought, gesture, signs, words, speeeh, physieal sensations, environment, etc., used to influence the mind of a patient. A simple suggestion is one given under ordinary eonditions where there is no degree of hypnosis present. An auto-suggestion is one arising entirely within one's own conseiousness from a thought, mental impression or physical sensation. Its basis may be real or imaginary. An oral suggestion is one expressed in speech. A mental suggestion is one eonveyed by thought only. A physieal suggestion is one whieh reaches and impresses the mind through any of the five physical senses. A hypnotie suggestion is any form of suggestion eonveyed to the patient during the hypnotie sleep. A negative hypnotie suggestion is one that neutralizes the will-power of the patient. A pre-hypnotie suggestion is one given before hypnosis or sleep and acted on while entering or during sleep. A post-hypnotie or deferred suggestion is one given during hypnosis to be aeted upon or carried out after hypnosis. This is the form of suggestion most frequently employed in the treatment of disorders. In law, information without oath; as an information drawn in writing showing eause to have a prohibition; or a surmise or representation of something, enrolled on the record of a suit or action, at the instance of a party thereto. In metaphysics, the same as association (see ASSOCIATION OF IDEAS).

Relative suggestion is judgment. Dr. Thomas Brown (1778–1820) Professor of Moral Philosophy in the University of Edinburgh, divided the intellectual states of mind into simple and relative suggestions: the first eorresponding to what others have called association, and the latter to judgment. He places under simple suggestion: Coneeption, memory, imagination, and habit; under relative suggestion; Coexistence and succession.

Suhl, a town of Prussia; province of Sachsen, at the base of the Domberg; 35 miles S. W. of Erfurt. It lies to the S. W. of the Thuringer-wald, and is sheltered by the Ottilienstein, a cliff of porphyry. Its firearms have been famous for several centuries, and its steel and iron wares are of superior quality. As its name indicates (Sorb-Wendish, "salt"), it was formerly a salt mining center. There are iron mines in the vicinity. A mineral spring rich in chloride of ealcium was discovered here in 1878, and the authorities undertook to transform the town into a fashionable watering place.

Suhm, Peter Frederik, a Danish historian; born Oct. 18, 1728; son of Admiral Ulrik Frederik Suhm; studied law at Copenhagen (from 1746), and in 1748 became assessor in the Supreme Court. In 1751 he married a rieh merehant's daughter of Throndhjem, where he remained for 14 years in elose friendship with the Norwegian historian Sehöning, on whose removal to Sorö (1765) he returned to Copenhagen. His great work is his "Historie åf Danmark," 14 volumes, of whieh he only published seven, the rest being published from his MS. by Kall and Nyerup (1806–1828). It eomes down to 1400 and is the most eopious collection of materials for Danish history. He also eontinued Langebek's "Scriptores rerum Danicarum." His "Samlade Skrifter" are published in 16 volumes (1788–1789). His library of 100,000 volumes he made over in 1796 to the great Royal Library at Copenhagen for a small life rent. He died Sept. 7, 1798.

Suicide, the act of designedly destroying one's own life. To constitute suieide, in a legal sense, the person must be of the years of diseretion and of a sound mind. The law of England treats suieide as a felony involving the forfeiture to the crown of all the personal property which the party has at the time he eommitted the aet, ineluding debts due to him; but it is not attended with forfeiture of freehold or corruption of blood. The body of the self-murderer was required to be buried without Christian rites in the open highway or cross roads, and a stake was thrust through it to mark the publie detestation. This law was repealed during the reign of George IV., and the only consequenees now are forfeiture of goods and deprivation of Christian rites. The burial may take place in a churehyard, but between 9 and 12 P. M. Suieide was treated as venial by the Romans, and was esteemed a virtue in certain eases, by the Stoie and Epicurean Philosophers. Valerius Maximus, who wrote in

Suicide

the 1st century, states that a poisonous liquor was kept publicly at Massilia, and that it was given to such as presented themselves before the Senate and procured its approval of the reasons which prompted them to get rid of life. Suicide is often set down as furnishing positive evidence of insanity, and it has been affirmed that the suicidal propensity is, in all cases and under all circumstances, a positive sign or symptom of insanity. This, however, is not in accordance with the opinions of many psychologists, nor is it consistent with well-known facts. The law of England treats suicide as a felony; and those who commit suicide are held to be sane and responsible, unless there be clear evidence to the contrary.

Suicide, however, is a very frequent result of insanity, more especially in Christian countries, and the verdict generally given by coroners' juries is that the person destroyed himself while in a state of unsound mind; not so much, however, from the fact of insanity being thereby established, as that any other verdict would distress the surviving relations and friends of the deceased. Suicidal mania or insanity may be defined as a perversion or reversal of the natural instinct of love of life, leading to its destruction. Drs. Bucknill and Tuke give the following classification of this form of insanity: "First, there are cases in which the instinct of self-preservation is more especially diseased, being as it were reversed in its operation. There is here a blind, unreasoning, irresistible impulse to commit suicide, a true suicidal monomania. This form may present the spectacle of an individual perfectly reasonable, influenced by an enlightened religion, physically and morally happy, well aware of the criminality of suicide, yet impelled to commit it in spite of himself by a force acting automatically and superior to his reason and will. Secondly, suicide may be the result, not of an instinctive monomania, but of melancholia. The degree in which the patient is depressed is not the measure of his tendency to suicide, at the same time intense depression is, in a large number of instances, the immediate antecedent of the suicidal act. The third division comprises those cases of suicide which spring from delusions, hallucinations," etc. Other and more vulgar causes of suicide are the love of notoriety, the force of imitation, and the remorse or fear that follows homicide.

The average annual suicide rate per 100,000 population in various countries is:

Saxony	31.1
Denmark	25.8
Austria	21.2
Switzerland	20.2
France	15.7
German Empire	14.3
Hanover	14
Queensland	13.5
Prussia	13.3
Victoria	11.5
New South Wales	9.3
Bavaria	9.1
New Zealand	9
South Australia	8.9
Sweden	8.1
Norway	7.5
Belgium	6.9
England and Wales	6.9
Tasmania	5.3
Hungary	5.2
Scotland	4
Italy	3.7
Netherlands	3.6
United States	3.5
Russia	2.9
Ireland	1.7
Spain	1.4

The average per 100,000 population is much greater in the cities than in town and country life. For instance it is in:

Dresden	51
Paris	42
Berlin	36
Genoa	31
Stockholm	27
Christiania	25
Lyons	29
Vienna	28
London	23
Brussels	15
Moscow	11
Geneva	11
Rome	8
St. Petersburg	7
Milan	6
Constantinople	12
Madrid	3
Lisbon	2

The causes leading to suicide have been variously assigned, but the following based on actual reports per 100 cases may be regarded as reliable: In European countries the record shows that 19 per cent. was due to vice and crime; 18 per cent. to madness and delirium; 14 per cent. to loss of intellect; 11 per cent. to alcoholism; 6 per cent. to moral sufferings; 4 per cent. to family matters; 4 per cent. to poverty and want; 3 per cent. to consequence of crime; 2 per cent. to disease; and 19 per cent. to unknown causes. In the United States the causes run about the same, except that insañity leads the list. It is also shown that double the number of suicides are committed during the daytime, and that June is the favorite month, and the 11th the favorite day.

The foregoing facts suggest many lessons, and perhaps the most striking is the increased percentage of suicide in the city. This is most probably due to the intensity of its social, professional, and business life. In this respect people in cities live from three to five years in one. This is apparently necessitated from the standpoint of subsistence or success. The sharp reverses incident to this high pressure not infrequently so dethrone the reason as to lead to self-destruction. Another important factor leading to the same result is the dissipation incident to city life. This dissipation appears in the extremes of high living or

poverty. And there is no denying the fact that intoxicants of every description play no unimportant part in sapping the life blood or in firing it with a dare-devil recklessness that leads to vice and infamy, and ultimately to suicide. It will be seen that, notwithstanding the great number of suicides per annum in the United States, it still stands 24th in the list, and is less cursed than any nation except Russia, Ireland, and Spain.

Among notable suicides (omitting cases referred to in Scripture) may be mentioned:

Sappho	7th c. B. C.
Empedocles (*q. v.*)	435
Demosthenes	322
Hannibal	183
Mithridates	63
Cato the Younger	46
Brutus and Cassius	42
Mark Antony	30
Cleopatra	30
Nero	A. D. 68
Otho	69
Maitland of Lethington	1573
Sir John Suckling (?)	1642
Robert Burton (?)	1649
Vatel the cook	1671
Earl of Essex	1683
Blount the Deist	1693
Eustace Budgell	1737
Chatterton	1770
Clive	1774
Rousseau (?)	1778
M. Roland	1793
Pichegru	1804
Tannahill	1810
Berthier	1815
Romilly	1818
Castlereagh	1822
Haydon	1846
Hugh Miller	1856
Admiral Fitzroy	1865
Prévost-Paradol	1870
E. M. Ward, painter	1879
Fred. Archer	1886
Louis II. of Bavaria	1886
Crown-prince of Austria	1889
Pigott	1889
Balmaceda	1891
Boulanger	1891

Suidæ, or **Suida,** in zoölogy, a family of artiodactyle mammals, of the Bunodont group (in which the crowns of the molars are tuberculated). The feet have only two functional toes, the other two being much shorter, and hardly touching the ground. Molars, incisors, and canines are present, the last very large, and, in the males, usually constituting formidable tusks projecting from the side of the mouth. The stomach is generally slightly divided, but is by no means so complex as in the *Ruminantia.* Snout truncated and cylindrical, capable of considerable movement, and adapted for rooting up the ground. The skin is covered with hair to a greater or less extent; tail very short, in some cases rudimentary. The family is divided into three well-marked groups or sub-families: *Suinæ,* true swine (*Sus, Potamochærus, Babirusa,* and *Porcula*); *Dicotylinæ* (*Peccaries,* with the single genus *Dicotyles,* often classed as a family); and *Phacochœrinæ* (wart hogs, with one genus, *Phacochœrus*). The family probably commenced in the Eocene Tertiary.

Sui Juris, in the Roman law, the condition of a person not subject to the *Patria Potestas.* The paterfamilias was the only member of a family who was *sui juris,* all the rest being *alieni juris,* including sons, unmarried daughters, the wife, and the wives and children of the sons of the paterfamilias. A son or unmarried daughter became *sui juris* on the death of the paterfamilias. In his father's lifetime a son could only become *sui juris* by emancipation.

Suir, a river of Ireland, flowing 85 miles S. and E., chiefly along the boundary of the counties of Tipperary, Waterford, Kilkenny, and Wexford, past Clonmel, Carrick, and Waterford, till it meets the Barrow, and immediately afterward falls into Waterford Haven. It is navigable by barges as far as Clonmel.

Sukkur, a town on the right bank of the Indus, 28 miles S. E. of Shikarpur; is connected by rail also with Karachi (Kurrachee), and is the terminus of the Bolan Pass railway to Afghanistan. The river is crossed by a magnificent cantilever bridge (1889), or rather by two bridges (one with a span of 820 feet), resting on the fortified island of Bukkur in the middle of the channel. New Sukkur, which grew up after the British occupied (1839) the fort on Bukkur, has considerable trade in silk, cloth, cotton, wool, opium, saltpeter, sugar, brass utensils, piece goods, metals, wines and spirits. Old Sukkur, about a mile away, has a good many old tombs in its immediate vicinity.

Sula, in ornithology, the gannet; a cosmopolitan genus of *Pelecanidæ,* with eight species. Bill forming an elongated cone, very large at base, compressed at point, which is slightly curved; mandibles serrated; angle of gape below the line of the eyes; face and throat naked; nostrils basal, obliterated; legs strong, short, three toes in front, one behind, all articulated by a membrane.

Sulcator, in zoölogy, a genus of amphipod crustaceans. *S. arenarius,* living on the sandy seashore, leaves tracks like those of annelids or the impressions of plants, which have been compared with those on some of the Palæozoic rocks.

Suleiman Pasha, a Turkish military officer; born in Rumelia in 1840. He entered the Turkish army in 1854, fought in Montenegro, Crete, and Yemen between that date and 1875, and in the intervals of peace taught in the Military Academy at Constantinople, and finally presided over it as director. He greatly distinguished himself as a corps commander against the Servians in 1876, and was in 1877 nominated gov-

ernor of Bosnia and Herzegovina. When the Russians declared war (1877) against Turkey Suleiman checked them at Eski Zagra, and destroyed his army in heroic but vain attempts to force them from the Shipka Pass. In October he was appointed commander-in-chief of the Army of the Danube, but failed to accomplish anything, retreated behind the Balkans, and suffered defeat near Philippopolis (January, 1878). Brought before a court-martial, he was condemned to be degraded and kept in a fortress prison for 15 years. The sultan, however, pardoned him, and he died in Constantinople Aug. 11, 1892.

Suliman Mountains, a range on the borders of Afghanistan and British India. The highest summit, Takht-i-Suliman, or "Suliman's Seat," attains an elevation of more than 6,000 feet (according to some estimates 11,000 or 12,000 feet). These mountains are covered with dense forests, and are generally considered the peculiar seat of the aboriginal Afghans.

Sulina, the middlemost of the three chief mouths of the Danube; it quits the Khedrile or most S. branch, and opens into the Black Sea after an E. course of over 50 miles (see DANUBE). It is used for transporting immense quantities of corn, chiefly for the British market. The passage over the bar at the mouth has been deepened by means of two piers at a cost of $500,000.

Suliots, or **Suliotes,** a people of mixed Albanian and Greek descent, who formerly dwelt in the S. corner of the pashalik of Janina (Epirus), in European Turkey. After having for about 15 years heroically resisted the encroachments of the pasha of Janina on their independence, they were vanquished by Ali Pasha in 1801. In 1820 they fought desperately against the Turks for their old oppressor; and, ultimately, they took a glorious part in the War of Greek Independence, but their country was not included by the treaty of 1829 within the Greek boundary. See ALI PASHA: BOZZARIS.

Sulla, Lucius Cornelius, a Roman dictator; born in 138 B. C. He received a good education, but was notorious from his youth upward for his excessive dissipation and debauchery. He served with distinction under Marius in the Jugurthine (107 B. C.) and Cimbrian (104–102) wars, and in 93 was chosen prætor. For his services in the Social War (90–88) he was appointed consul (88 B. C.), and the province of Asia, with the conduct of the war against Mithridates, fell to his lot. Marius was also ambitious of this command, and resorted to acts of violence to carry his point, by which Sulla was compelled to escape from Rome. But Sulla reëntered the city at the head of his army, drove Marius to Africa, and then sailed for Greece at the beginning of 87 B. C. He expelled the armies of Mithridates from Europe (86), crossed into Asia (84), and was everywhere victorious, gaining plenty of wealth for himself and his soldiers, and forcing Mithridates to conclude a peace. Marius had died in 86 B. C., after proscribing Sulla and confiscating his property, but the party of Marius was still strong. Sulla now hastened to Italy, and landed at Brundusium with 40,000 men, 83 B. C. He was joined by many of his friends who had been banished from Rome. He gained four battles over the Roman forces in person, and defeated a Samnite army under Telesinus. He entered the city victorious in 82, and immediately put to death between 6,000 and 7,000 prisoners of war in the circus. Rome and all the provinces of Italy were filled with the most revolting scenes of cruelty. After satisfying his vengeance by the murder or proscription of thousands he caused himself to be named dictator for an indefinite period (81 B. C.). He now ruled without restraint, repealed and made laws, abolished the tribuneship, and settled his veterans in various parts of Italy. In 79 B. C. he laid down his dictatorship, and retiring to Puteoli abandoned himself to all sorts of debauchery. He died in 78 B. C. See ROME.

SULLA.

Sullivan, Sir Arthur Seymour, an English composer; born in London, England, May 13, 1842; became a member of the boy choir in the Chapel Royal at St. James's, and at the age of 13 published his first composition. In the following year he won the Mendelssohn scholarship at the Royal Academy of Music, and in 1858, while at Leipsic, he composed his "Feast of Roses" and the music to Shakespeare's "Tempest." Subsequently he produced numerous songs, operas, oratorios, etc. He was knighted in 1883 and made chevalier of the Legion of Honor of France in the same year. He died in London Nov. 21, 1900.

Sullivan, Barry, an English tragedian; born in Birmingham in 1824; first ap-

peared at Cork in 1840; played at Edinburgh and elsewhere; and at the Haymarket in London as Hamlet in February, 1852. He visited the United States in 1857–1860, and Australia in 1861–1866. He was afterward for a while lessee of the Holborn Theater; but he was more popular in the provinces, especially in Ireland and the W. of England. He died in Brighton, England, May 3, 1891.

Sullivan, James William, an American writer; born in Carlisle, Pa., March 9, 1848. He was author of: "Working People's Rights" (1885); "A Concept of Political Justice" (1890); "Direct Legislation Through the Initiative and Referendum" (1892)—this book started the referendum movement in the United States; "Tenement Tales of New York" (1894); "So the World Goes," a series of short stories (1898).

Sullivan, John, an American military officer; born in Berwick, Me., Feb. 17, 1740; studied law and obtained a lucrative practice in Durham, N. H. He was commissioned a major of militia in 1772; represented New Hampshire at the Continental Congress held in Philadelphia, Pa., in 1774; was appointed a Brigadier-General of the American army in 1775; and given command of the left wing of the forces then laying siege to Boston. In June, 1776, he was placed in command of the army on the Canadian boundary. After an unsuccessful engagement with the British at Three Rivers (*q. v.*), he retreated to New York, and for a time was chief in command on Long Island; subsequently was promoted Major-General. During Washington's campaign, which resulted in the capture of the Hessians at Trenton, Sullivan had command of the right wing of the army. He also participated in the battle of Princeton, and later descended rapidly on Staten Island and took 100 prisoners. He was at the battles of the Brandywine and Germantown, and during the latter action defeated the British left. On Aug. 29, 1778, he attacked the British at Butt's Hill, near Newport, R. I., and after a 12-hours' severe battle, in which about 6,000 men fought on each side, the Americans drove the British from the field at the point of the bayonet. Lafayette pronounced this engagement the best contested one of the whole war. In 1779 Sullivan led 4,000 troops into New York State to put a stop to Indian outrages. During the campaign he drove thousands of Indians out of the State and destroyed their crops and villages. He resigned from the army in 1780 owing to ill health, and was a second time a delegate to the Continental Congress. He later resumed the practice of law in New Hampshire; and was United States judge of that State from 1789 till his death, in Durham, N. H., Jan. 23, 1795.

Sullivan, Thomas Russell, an American dramatist; born in Boston, Mass., Nov. 21, 1849. His novels include "Tom Sylvester," "Roses of Shadow," "Day and Night Stories," "Ars et Vita" (1898); and his plays, "The Catspaw" (1881), "Merely Players" (1886), and a dramatization of Stevenson's "Dr. Jekyll and Mr. Hyde" (produced 1886). He was joint author with W. W. Chamberlin of "Hearts Are Trumps," produced 1878, and "Midsummer Madness," produced 1880.

Sullivan's Island, an island at the N. side of the entrance to Charleston harbor, S. C.; 6 miles from Charleston. It is 6 miles long, but very narrow, and is a favorite sea-bathing resort. On it is situated Fort Moultrie, a position of importance during the Civil War.

Sully, Alfred, an American military officer; born in Philadelphia, Pa., in 1821; was graduated at the United States Military Academy in 1841, and assigned to the 2d Infantry, with which he took part in the Seminole War; served in the war with Mexico in 1846–1847; and was then assigned to duty on recruiting service in the North. In 1861–1862 he served in Washington and in the latter year was made colonel of the 3d Minnesota Volunteers; won distinction in the battles of Fair Oaks and Malvern Hill; was promoted Brigadier-General of volunteers in October, 1862, and later participated in the battle of Chancellorsville. In 1863 he was given command of the Department of Dakota, and greatly distinguished himself in his campaigns against hostile Indians. At the close of the war he was brevetted Major-General of volunteers, and Brigadier-General, U. S. A., for gallantry during the war; and was promoted colonel of the 10th Infantry in 1872. He died in Fort Vancouver, Wash., April 17, 1879.

Sully, Maximilien de Béthune, Duc de, Marshal of France and first minister of Henry IV.; born in Bosny, France, Dec. 13, 1560; was educated in the Protestant (Calvinistic) faith. He distinguished himself at the battle of Ivri in 1590, where he was severely wounded, and was afterward of great assistance to the king in resisting the intrigues of the League. In 1597 he was appointed controller of finance, and by his excellent administration largely reduced taxation, and eventually paid off a state debt of 300,000,000 livres. He also received many other offices and dignities, and became adviser of the king in all his councils. His industry was unwearied, and he did all he could to encourage agriculture, which he regarded as the mainstay of the state. In 1606 the territory of Sully-

sur-Loire was erected into a duchy in his favor. After the murder of Henry IV. (1611) he retired from court and resigned most of his charges. He now occupied himself chiefly with agriculture, and rarely

DUKE OF SULLY.

took part in political affairs. He was created Marshal by Richelieu in 1634, and died in Villebon Castle, France, Dec. 22, 1641. He left memoirs which have been published in English.

Sully=Prudhomme, René François Armand (sü-lē′prüd-um′), a French poet; born in Paris, France, May 16, 1839. He wrote: "Stanzas and Poems" (1865); "The Broken Vase"; "The Stables of Augeas"; "The Wildernesses"; "Impressions of War" (collected 1872); "Revolt of the Flowers" (1874); "Reflections on the Art of Versification" (1892). He was elected a member of the Academy in 1881, and in 1901 received one of the Nobel prizes amounting to about $40,000. He died Sept. 7, 1907.

SULLY-PRUDHOMME.

Sully, Thomas, an American artist; born in Horncastle, Lincolnshire, England, in 1783; emigrated to the United States with his parents in 1792; studied painting in Charleston; established himself in Richmond, Va., as a portrait painter in 1803; removed afterward to New York; and in 1809 settled in Philadelphia where he afterward lived. His reputation as one of the leading American portrait painters is founded on numerous works, the best known of which are the full-length portraits of Dr. Benjamin Rush, Commodore Decatur, Thomas Jefferson, and Lafayette. The Boston Museum possesses his celebrated picture of "Washington Crossing the Delaware." He died in Philadelphia Nov. 5, 1872.

Sulmona, or **Solmona,** a city of Italy, 80 miles E. of Rome. It stands 1,575 feet above sea-level, has a cathedral (1119), and paper and fulling mills. Here were born Ovid and Pope Innocent VII. On a mountain close by stood till 1870 the "mother monastery" of the Celestines. Pop. about 15,000.

Sulphacetamide, Schulze's name for the compound $\left.\begin{matrix}(C_4H_4S''O_2)''\\H_4\end{matrix}\right\}N_2$; produced by the action of ammonium sulphide on chloracetamide.

Sulphacetic Acid, glycolyl-sulphurous acid; formula, $C_2H_4SO_5=\left.\begin{matrix}(C^2H_2SO_3)''\\H_2\end{matrix}\right\}O_2$; a dibasic acid produced by the action of sulphuric anhydride on glacial acetic acid. It forms colorless deliquescent prisms, which melt at 62°, and are very soluble in water, forming an acid solution. Its salts are all soluble in water, but insoluble in alcohol.

Sulphacetylenic Acid, formula, $C_2H_4SO_5=\left.\begin{matrix}(C_2H_2)''\\(SO_2)\\(H_2)\end{matrix}\right\}O_3$; isomeric with sulphacetic acid, and obtained by heating argentic sulphate with acetyl chloride to 120°, and treating the product with water. It is a viscid, unstable liquid, and gradually decomposes into sulphuric and acetic acids.

Sulphamethylane, formula, $CH_5NSO_3=\left.\begin{matrix}H_2\\(SO_2)''\\CH_3\end{matrix}\right\}\begin{matrix}N\\O\end{matrix}$ methylic sulphamate; formed by dissolving methylic sulphate in aqueous ammonia, and crystallizing, by evaporation in a vacuum. It forms large, very deliquescent crystals.

Sulphamic Acid, formula, $NH_3SO_3=\left.\begin{matrix}NH_2(SO_2)''\\H\end{matrix}\right\}O$; unknown in the free state, but known in its salts; sulphamate of ammonium, $2NH_3.SO_3$; sulphatammon; sulphammon; a white, crystalline powder, obtained by passing dry ammonia gas over a thin layer of sulphuric anhydride. Permanent in air; taste bitter; soluble in nine parts of water, insoluble in alcohol.

Sulphamide, in chemistry, $H_4SO_2N_2 = \left.\begin{matrix}(SO_2)''\\H_4\end{matrix}\right\} N_2$; produced, according to Regnault, when dry ammonia gas is passed over sulphuric chloride.

Sulphamidonic Acid, $C_{24}H_{48}O_{24}2SO_3$ (?); a syrupy deliquescent acid, produced by triturating starch with strong sulphuric acid. Its salts are all amorphous, deliquescent, easily soluble in water, and very unstable.

Sulphamylic Acid, $(C_5H_{11})HSO_4$; amylsulphuric acid; a colorless, thin syrup, obtained by allowing a mixture of sulphuric acid and amylic alcohol to stand in a cool place till water no longer separates amylic alcohol from it. It has an acid, bitter taste, and is very soluble in water and alcohol, the aqueous solution decomposing spontaneously into amylic alcohol and sulphuric acid.

Sulphanethic Acid, $C_{10}H_{14}O \cdot SO_4$ (?); sulphanetholic acid; obtained by the action of strong sulphuric acid on anise camphor. Its soluble salts are colored deep violet by ferric solution.

Sulphanilic Acid, $C_6H_7NSO_3 = \left.\begin{matrix}NH(C_6H_5)\\(SO_2)''\\H\end{matrix}\right\} O$; phenylsulphamic acid; formed by the action of sulphuric acid on aniline, or on oxanilide. It crystallizes from hot water in shining rhombic plates, soluble in boiling water, slightly soluble in cold water, still less soluble in alcohol, insoluble in a mixture of alcohol and ether. Heated with a solid caustic alkali, it gives off aniline, leaving an alkaline sulphate. Its salts are soluble and crystallizable.

Sulphates, salts of sulphuric acid. Sulphuric acid is dibasic, forming two classes of sulphates, viz., neutral sulphates, in which the two hydrogen atoms of the acid are replaced by metal, and acid sulphates, in which one hydrogen atom only is so replaced. The general formula of the former class is M_2SO_4, and of the latter $MHSO_4$. (M represents a monovalent metal.) Of the sulphates, some are found native; some are very soluble, some sparingly soluble, and some insoluble. The most important sulphates are: Sulphate of aluminum and potassium, or alum; sulphate of ammonium, employed for making carbonate of ammonia; sulphate of copper, or blue vitriol, much used as an escharotic in surgery, and also used in dyeing and for preparing certain green pigments; sulphate of iron, or green vitriol, used in making ink, and very extensively in dyeing and calico printing; it is also much used in medicine; sulphate of calcium, or gypsum; sulphate of magnesium, or Epsom salts; sulphate of manganese, used in calico printing; sulphate of mercury, used in the preparation of corrosive sublimate and of calomel; bisulphate of potash, much used as a flux in mineral analysis; sulphate of sodium, or Glauber's salts; sulphate of quinine, much used in medicine; sulphate of zinc, or white vitriol, used in surgery, also in the preparation of drying oils for varnishes, and in the reserve or resist pastes of the calico printer. Many double sulphates are known.

Sulphato-carbonate of Barytes, in mineralogy, a variety of witherite, containing a sulphate; now shown to be a result of partial alteration.

Sulphazotised Acids, a series of acids, the salts of which are formed by the action of sulphurous anhydride upon a solution of potassium, sodium, or ammonium nitrite, containing a large excess of free alkali. The potassium salts may be represented by the following formulæ: Sulphazite of potassium $= 3K_2O \cdot S_3H_6N_2O_{12}$; sulphazate of potassium $= 3K_2O \cdot S_4H_6N_2O_{14}$; sulphazotate of potassium $= 3K_2O \cdot S_5H_6N_2O_{16}$.

Sulphide of Cacodyl, sulpharsin; formed by adding barium sulphide to crude cacodyl. It is a transparent liquid, fluid at 40°, and boiling at 100°; formula, $As_2(CH_3)_4S$.

Sulphide of Chlorine, Cl_2S_2; prepared by passing dry chlorine gas into a retort in which sulphur is sublimed, and collecting the distillate in a receiver surrounded by cold water. It is a mobile reddish-yellow liquid, having a penetrating, disagreeable odor, and fuming strongly in the air. Sp. gr., 1.687; boils at 139°.

Sulphindigotic Acid, sulphindylic acid; a deep blue pasty mass, obtained by heating one part of indigo with 15 parts concentrated sulphuric acid for three days, at 40° to 50°. It is soluble in water and alcohol, and is used in dyeing. Formula $C_{16}H_{10}N_2O_2 \cdot 2SO_3 = C_{16}H_8(SO_2 \cdot OH)_2N_2O_2$.

Sulphinic Acids, compounds analogous to sulphonic acids or acid ethers of hyposulphurous acid; formed by the action of sulphur dioxide on the zinc compounds of the alcohol radicals. Methyl sulphinic acid $= CH_4SO_2$.

Sulphion, in chemistry, SO_4; a term applied in electro-chemistry to a supposed radical, resulting from the electrolysis of sulphuric acid, H_2SO_4, the hydrogen being carried to the negative electrode, and sulphion set free; this, however, being immediately broken up into $SO_3 + O$, the latter passing over to the positive electrode.

Sulphisatyde, or **Sulphisatin,** a grayish-yellow powder obtained by passing sulphydric acid into an alcoholic solution of isatine, filtering, and precipitating by the addition of water. It is soluble in alcohol, insoluble in water. Formula, $C_{16}H_{12}N_2O_2S_2$.

Sulpho-purpuric Acid, sulphophœnic acid; indigo-purple; a purple-red powder obtained by mixing one part indigo-blue with eight parts strong sulphuric acid, keeping it at a temperature of 60° for three days, diluting with water, filtering, washing the residue with dilute hydrochloric acid and drying on an oil bath at 100°. It is slightly soluble in water, but very soluble in sulphuric acid. Formula, $2C_8H_5NO,SO_3$.

Sulphobenzamic Acid, $C_7H_7NSO_4 = (C_7H_4SO_3)''\begin{matrix}H_2\\H\end{matrix}\begin{matrix}N.\\O.\end{matrix}$ A monobasic acid produced by heating sulphobenzamide in strong potash lye for some hours in a water bath. It crystallizes in rhombohedral crystals or needles, insoluble in cold water, slightly soluble in ether, but soluble in hot water and in alcohol; melts above 100°, and solidifies on cooling in a crystalline mass. Its salts are all more or less soluble in water.

Sulphobenzamide, in chemistry, $C_7H_8N_2SO_3 = (C_7H_4SO_3)''\begin{matrix}\\H_4\end{matrix}\Big\}N_2$; obtained by treating sulphobenzoic chloride with strong ammonia. It dissolves readily in hot water and hot alcohol, melts at 170°, and is slowly decomposed at 270°–290°.

Sulphobenzide, $C_{12}H_{10}SO_2$; a compound formed by the action of sulphuric anhydride on benzol, and treating the product with a large quantity of water. It crystallizes in rhombic plates, insoluble in water and in alkalies, soluble in alcohol and ether, melts at 128°, and boils at a much higher temperature.

Sulphobenzoic Acid, $C_7H_6O_5S = C_6H_4\begin{matrix}\cdot SO_2\cdot OH.\\\cdot CO\cdot OH\end{matrix}$ a monobasic, aromatic, deliquescent acid, formed by heating benzoic acid with Nordhausen sulphuric acid, or by passing the vapor of sulphuric anhydride over dry benzoic acid. It is obtained in strongly-acid crystalline masses readily soluble in water.

Sulphocarbamic Acid, CH_3NS_2; a reddish, oily liquid obtained by passing ammoniacal gas into carbon disulphide, and decomposing the salt formed with hydrochloric acid. It solidifies at ordinary temperatures to a crystalline mass which soon decomposes into sulphocyanic and hydric sulphide.

Sulphocyanate of Potassium, CNKS; obtained by gradually heating to low redness a mixture of dried potassium, ferrocyanide, sulphur, and pure potassium carbonate, exhausting with water, and evaporating the aqueous solution to dryness. It crystallizes in long, slender, colorless prisms, soluble in water and alcohol, and deliquesces when exposed to a moist atmosphere.

Sulphocyanic Acid, HCNS; hydrogen sulphocyanate; a monobasic acid obtained by decomposing lead sulphocyanate suspended in water, with sulphuretted hydrogen. It is a colorless, very acid liquid, with a pungent acetous odor, and solidifies at −12.5° to hexagonal plates. Heated to 100° it boils, but the greater part suffers decomposition. It colors ferric salts an intense blood-red, and on this account is used, in the form of any of its soluble salts, to detect traces of iron.

Sulphodraconic Acid, a conjugated acid produced, according to Laurent, by treating oil of anise or tarragon with a large excess of sulphuric acid.

Sulphoform, an oily liquid produced in small quantity by distilling iodoform with mercuric sulphide.

Sulphoglucic Acid, $(C_6H_{12}O_6)_4SO_3$; sulphosaccharic acid; an unstable acid formed by treating glucose with strong sulphuric acid. It is obtained in the form of a liquid having a sour and sweet taste, and which does not precipitate barium salts.

Sulphoglutinic Acid, a glutinous acid formed, together with other products, by the action of sulphuric anhydride in excess, on naphthalene.

Sulphohippuric Acid, $C_9H_9NO_3SO_3$; formed by treating hippuric acid with sulphuric anhydride. By decomposing its lead salt with sulphydric acid it is obtained as a brown amorphous deliquescent mass. It is dibasic, its neutral barium salt having the composition, $C_9H_7BaNO_3SO_3$.

Sulpholeic Acid, an oily acid, similar to and produced in the same way as sulphomargaric acid, and not separable from it.

Sulphomannitic Acid, $C_6H_{14}O_63(SO_3)$; an acid produced by dissolving mannite in strong sulphuric acid. It appears to be tribasic, forming deliquescent salts with the alkalies, and a crystalline salt with baryta.

Sulphomargaric Acid, an oily acid, produced, according to Fremy, by the action of strong sulphuric acid on olein at low temperatures. It separates as an oil from the acid liquid, but is soluble in both water and alcohol, as are its salts of the alkalies.

Sulphomellonic Acid, $C_3H_4N_4S_2 = CyH_2\cdot N2(CyHS)$; obtained as a potassium salt by boiling persulphocyanogen with sulphydrate of potassium. It is separated from sulphur by treatment with aqueous ammonia and afterward purified by animal charcoal. It forms small colorless needles, tasteless, nearly insoluble in cold water, alcohol, and ether, but slightly soluble in boiling water. It is monobasic, the potassium salt, $C_3N_4H_3KS_2$, forming colorless shining prisms soluble in water and alcohol.

Sulphomethylic Acid, $(CH_3)HSO_4$; methylsulphuric acid, produced when one part of wood spirit is added to two parts of sulphuric acid, and obtained pure by decomposing its barium salt with sulphuric acid. It forms colorless needles soluble in water and alcohol, and combines with the alkaline and metallic bases to form salts. The barium salt, $(CH_3)_2Ba(SO_4)_2 + 2OH_2$, is obtained in beautiful nacreous tables or laminæ, very soluble in water.

Sulphonaphthalene, $\left.\begin{matrix}C_{10}H_7\\C_{10}H_7\end{matrix}\right\}SO_2$; obtained by acting on an excess of fused naphthalene with the vapor of sulphuric anhydride. It crystallizes from its alcoholic solution in tasteless, inodorous nodules, melts at 70°, is slightly soluble in water, more soluble in boiling alcohol.

Sulphonic Acids, acid ethers of sulphurous acid in which one of the bonds of sulphur is united to the carbon of the organic radical, as methylsulphonic acid CH_4SO_3. They are formed by treating the haloid ethers with solution of sodium sulphite.

Sulphophenic Acid, $(C_6H_5)HSO_4 = (C_6H_4)OH \cdot SO_3H$; phenylsulphuric acid; prepared by treating phenol with strong sulphuric acid, converting the compound into the barium salt, and, after purification, decomposing it with an equivalent of sulphuric acid. Evaporated in a vacuum, it may be obtained in needle-shaped crystals. It forms well-defined but unimportant crystalline salts with the alkalies and metals.

Sulphophenylamide, $\left.\begin{matrix}C_6H_5SO_2\\H_2\end{matrix}\right\}N$; produced by the action of sulphophenylic chloride on ammonia. The product is washed with cold water to dissolve out chloride of ammonia, and the residual compound crystallized from a small quantity of boiling alcohol. It is obtained in splendid nacreous scales, melting at 153°; insoluble in cold water, easily soluble in alcohol, and capable of combining with metals or organic radicals.

Sulphophenylic Chloride, $C_6H_5(SO_2)Cl$; produced by adding to sodic phenylsulphite small quantities of oxychloride of phosphorus till a syrup is formed, distilling the product, rectifying the distillate, and collecting the portion boiling at 254°. It is a colorless, strongly-refracting oil, having the odor of bitter almond oil and a sp. gr. of 1.378 at 23°.

Sulphophloramic Acid, produced by treating phloramine with strong sulphuric acid, converting the compound into a barium salt and decomposing with sulphuric acid. It forms colorless needles, yielding a deep violet color with ferric chloride, even in very dilute solutions.

Sulphophloretic Acid, $C_9H_{10}SO_6$; produced by the action of sulphuric anhydride on phloretic acid. It forms a very sour syrup, easily soluble in water and alcohol, and forming crystalline salts with baryta and lime.

Sulphosalicylic Acid, $C_7H_6O_3(SO_3)$; produced by the action of sulphuric anhydride on perfectly dry salicylic acid. It crystallizes in long thin needles which dissolve in all proportions in alcohol, water, and ether, and melt at 120°. It is a strong permanent acid, dissolving zinc with evolution of hydrogen, and forms neutral and acid salts, nearly all of which are soluble in water, and produce a deep violet coloration with ferric salts.

Sulphosalicylol, C_7H_6OS; thiosalicol; a pulverulent substance produced by the action of sulphydric acid on hydro-salicylamide in alcoholic solution. It forms salts with the alkalies, and colors ferric salts violet-red.

Sulphosinapic Acid, $C_3H_5CNSH_2S$; known only in combination with a base. Its salts are formed by the direct union of allylic sulphocyanate with a metallic sulphydrate, as in the case of the potassium compound $(C_3H_5)CNSKHS$, which is obtained in large transparent rhombic crystals, readily decomposing on exposure to the air.

Sulphosuccinic Acid, $C_2H_3\left\{\begin{matrix}COOH\\SO_3H\\COOH\end{matrix}\right.$; a tribasic acid produced by exposing succinic acid to the vapor of sulphuric anhydride for several hours. The acid thus obtained forms mammillated crystals very soluble in water, alcohol, and ether. It forms salts with the alkalies and metallic bases, some of which are crystallizable.

Sulphotoluolamide, $\left.\begin{matrix}C_7H_7SO_2\\H_2\end{matrix}\right\}N$; formed in the same way as sulphophenylamide, and obtained in needles or laminæ.

Sulphovinic Acid $(C_2H_6SO_4)$, formed by the action of sulphuric acid on alcohol, an action accompanied by a great evolution of heat. It forms sulphovinates which are easily decomposed by heat. In the preparation of ether from alcohol and sulphuric acid, sulphovinic acid is an intermediate product if the temperature be under 100° C.

Sulphur. Sulphur, or brimstone, has been known and used from the earliest times. It is found native in mechanical combination with various earthy impurities in most volcanic districts, more particularly in Sicily and the countries bordering on the Mediterranean. The native sulphur of commerce is derived chiefly from Sicily, where it occurs in beds of blue-clayey for-

mation. It is found native in two forms — in transparent amber crystals, as virgin sulphur; or in opaque, lemon-yellow crystalline masses, as volcanic sulphur. It is found in combination with the different metals, forming metallic sulphides, in nearly every portion of the earth. Zinc blende, iron, and copper pyrites, galena, cinnabar, gray antimony, and realgar, are a few instances of the valuable ores containing sulphur. In its oxidized condition, as sulphuric acid, it is also very largely distributed over the mineral kingdom. Sulphur exists in many organic bodies; for example, it is always contained in albumen and the various protein compounds. Native sulphur is purified from the foreign substances mixed with it by distillation in, first, long brick furnaces containing earthen retorts communicating with chambers of the same material; and afterward in iron retorts communicating with chambers of brickwork, in which the sulphur condenses in light flocks, known as flowers of sulphur. When melted and cast, these form the roll brimstone of commerce. Till lately the Sicilian sulphur was exported as far as California, but now the sulphur works on the shore of Clear Lake produce a quantity sufficient for the consumption of that State, and the manufacture of the compounds of sulphur has already taken a great importance. Sulphur can also be easily extracted from iron and copper pyrites. Iron pyrites form the yellow metallic-looking substance which is often met with in masses of coal, sometimes in distinct cubical crystals, and which is to be picked up in large quantities on some sea beaches, where it occurs in rounded nodules, rusty outside, but having a fine radiated metallic fracture. When the mineral is strongly heated it gives up part of its sulphur; at a very high temperature one-half of the sulphur may be separated; but by an ordinary furnace heat only about one-fourth can be obtained. The distillation of iron pyrites is sometimes effected in conical fire-clay vessels, closed at the wider end, and stopped toward the other with a perforated plate to allow the passage of the sulphur vapor. Each vessel contains 100 pounds of pyrites, and yields 14 pounds of sulphur. At ordinary temperatures, sulphur is a brittle, insoluble, inodorous solid, of a lemon-yellow color, a bad conductor of heat, and a non-conductor of electricity. By friction with silk or wool, it becomes negatively electrified. It is a highly inflammable substance, burning readily in the air at about 450° or 500° F., and giving off suffocating fumes of sulphurous acid gas. At 239° F. it melts, forming a yellow liquid, and slightly increasing in bulk. Provided the above temperature is not exceeded, it remains nearly transparent on cooling, but becomes gradually opaque from interior molecular changes. In close vessels, it may be distilled by raising the heat to about 834° F. Sulphur is very remarkable as affording a striking instance of the occurrence of the allotropic condition of matter. Hydrogen and sulphur vapor, when burnt, form sulphuretted hydrogen. Burnt in oxygen, heated with chlorine, bromine, and iodine, it unites with them, forming well-known compounds. The vapor of sulphur passed over red-hot charcoal forms bisulphide of carbon. Nearly all the metals combine with it at ordinary or increased temperatures. With oxygen, sulphur forms seven different compounds:

Sulphurous acid	SO_2
Sulphuric acid	SO_3
Dithionous or hyposulphurous acid	S_2O_2
Dithionic or hypossulphuric acid	S_2O_5
Trithionic acid	S_3O_5
Tetrathionic acid	S_4O_5
Pentathionic acid	S_5O_5

Sulphur unites with chlorine in two proportions, forming a dichloride and a chloride. The dichloride, S_2Cl, is prepared by transmitting a current of chlorine over melted sulphur, the resulting dichloride being collected in a perfectly dry receiver. It is a dark yellow liquid, very volatile, and possesses a peculiar penetrating disagreeable odor. It emits fumes when exposed to moist air, and when dropped into water gradually decomposes into hydrochloric and sulphurous acids and free sulphur. It has a sp. gr. of 1.658, and boils at 280° F. It is used for vulcanizing india-rubber goods. By saturating dichloride of sulphur with chlorine, a dark red liquid chloride is formed. There is reason to suppose that a bichloride exists but it has not yet been isolated. The corresponding bromides are liquids analogous to the chlorides. The iodide is a crystalline brittle gray solid. With nitrogen, sulphur forms a bisulphide which crystallizes in beautiful golden-yellow rhombic crystals. It detonates powerfully by percussion, or when heated to 314° F. Bisulphide of carbon dissolves it readily, alcohol, ether, and oil of turpentine sparingly, and water not at all. Symbol S; at. wt. 32.

Sulphurea, CSN_2H_4; sulpho-carbonyl diamide; obtained by heating dry ammonic sulpho-cyanate slowly to 170°, keeping at that temperature for several hours, cooling to 100°, dissolving in an equal weight of water at 80°, filtering, and allowing the filtrate to crystallize. It forms small prisms, soluble in water and alcohol, insoluble in ether, and fuses at 149°.

Sulphuretted Waters, hot or cold mineral waters holding in solution sulphides or free sulphuretted hydrogen. They are stimulant, diaphoretic, and alterative. The sul-

Sulphuric Acid

phuretted hydrogen imparts to them a nauseous odor like that of rotten eggs. The chief thermal sulphuretted waters are those of Aix-la-Chapelle, Baden, near Vienna, Aix-les-bains, etc.; the chief cold ones are Harrogate and Bocklet. Such baths are recommended in cutaneous, hepatic, uterine, rheumatic, gouty, neuralgic, and other diseases.

Sulphuric Acid, a very important acid which occurs in nature in large quantities, both in the vegetable and mineral kingdoms, in combination with the various bases, more particularly the alkalies, alkaline earths, and the oxides of iron, copper, lead, zinc, alumina, etc. Its mineral combinations are generally known as vitriols, a name which, in the case of the sulphates of iron, copper, and zinc, has been transferred to the manufactured products. Sulphuric acid is formed by the oxidation of sulphurous acid, or some other oxide of sulphur. In its perfectly anhydrous condition, it occurs as a white crystalline fibrous mass, somewhat resembling asbestos in appearance. It can be molded in the fingers like wax without charring the skin; it fumes in the air, and is very deliquescent, hissing violently when thrown into water; thereby becoming sulphuric acid. It chars wood, paper, sugar, and other similar substances, by abstracting water from them. It melts at 65° F., and boils at 110° F., forming a colorless vapor. It possesses no acid properties whatever, and is not regarded as such by the followers of Gerhardt, by whom it is called sulphuric anhydride. The vapor, when passed through a red-hot tube, is resolved into a mixture of one volume of oxygen with two volumes of sulphurous acid. With sulphur it forms several more or less definite compounds, of a brown, green, and blue color respectively, which have not as yet received sufficient investigation. There are two varieties of sulphuric acid in commerce. The first of these, fuming or Nordhausen sulphuric acid, is obtained by the distillation of the basic sulphate of iron formed by heating crystals of common green vitriol. It is a somewhat viscid liquid, generally of a light-brown color, from containing traces of organic matter, and has a sp. gr. of 1.896. It is believed to be a combination of equal parts of the anhydrous and monohydrated sulphuric acid, and may be represented by the formula $H_2SO_4SO_3$. It solidifies at 32° F. into a mass of transparent colorless crystals. It is chiefly used in the arts for dissolving indigo. The second variety is the ordinary sulphuric acid, or oil of vitriol, of commerce. It is prepared in immense quantities by burning sulphur or roasting pyrites, and oxidizing the resulting sulphurous acid by means of aqueous vapor and certain oxides of nitrogen. The following experiment will illustrate the important chemical principles of the manufacture of sulphuric acid, and will give an idea of the process employed in the manufacture of this acid on a large scale. A large glass flask or globe is fitted with a cork, through which are passed — a tube connected with a flask containing copper and strong sulphuric acid for evolving sulphurous acid; a tube connected with the flask containing copper and diluted nitric acid (sp. gr. 1.2) for supplying nitric oxide; a tube proceeding from a small flask containing water. On applying a gentle heat to the flask containing nitric acid and copper, the nitric oxide passes into the globe and combines with the oxygen of the air, filling the globe with red nitric peroxide. The nitric oxide flask may then be removed. Sulphurous acid is then generated by heating the flask containing sulphuric acid and copper; the sulphurous acid will soon decolorize the red nitric peroxide, the contents of the globe becoming colorless, and the crystalline compound forming abundantly on the sides; the sulphurous acid flask may then be removed. Steam is sent into the globe from the flask containing water, when the crystalline compound will be dissolved, and sulphuric acid will collect at the bottom of the globe. If air be now blown into the globe, the nitric oxide will again acquire the red color of nitric peroxide. If the experiment be repeated, the steam being introduced simultaneously with the sulphurous acid, no crystalline compound whatever will be formed, the sulphurous acid being at once converted into hydrated sulphuric acid. When pure, sulphuric acid is a heavy, oily, colorless, inodorous liquid, and having a sp. gr. of 1.842. It is intensely caustic, and chars almost all organic substances, by abstracting water from them. Its affinity for water is very great, doubling its weight by the absorption of vapor from the air, if left exposed in any open vessel for several days. It mixes with water in all proportions. It freezes at 29° F., and boils at 590° F., its vapor being colorless and very suffocating, forming dense fumes in moist air. When mixed with water, it evolves considerable heat. Sulphuric acid is the starting point of nearly every important chemical manufacture. Acetic, nitric, and hydrochloric acids are made by its means; and it will be only necessary to allude to the important part it plays in the manufacture of soda from common salt, to appreciate the saying of Liebig, "that the amount of sulphuric acid made in a country is a sure index of its wealth and prosperity." In the hands of the chemist it has numerous and important uses. Its salts, the sulphates, are among the most important chemical agents in the laboratory. In its concentrated form, it is in daily use by the scientific chemist to promote the crystallization of deliquescent substances in vacuo,

from its intense avidity for water. Besides the monohydrate above described, sulphuric acid forms several other well-marked hydrates; among which may be noticed the bihydrate, a colorless liquid, having a sp. gr. of 1.78, and solidifying in transparent colorless prisms at about 40° F.; hence it is often called glacial sulphuric acid. It may be easily formed by mixing the monohydrate with water, till the proper specific gravity is reached. If a very dilute acid be evaporated in vacuo till it ceases to lose weight, a definite terhydrate is formed, having a density of 1.632. The oil of vitriol of commerce is never pure, but contains lead derived from the leaden chambers in which it is made, arsenic, and nitric acid. The first impurity is detected on dilution, sulphate of lead (which is less soluble in dilute than in strong acid) falling down as a milky precipitate. Arsenic gives a yellow precipitate with sulphuretted hydrogen; and nitric acid a purplish-red coloration when a solution of green vitriol is added to the suspected acid. In its concentrated form, it acts but feebly on metallic bodies. When water is present, the more easily oxidizable metals are dissolved with the evolution of hydrogen. The sulphates are a numerous and important class of salts. They are mostly composed of an equivalent of acid and an equivalent of the metallic oxide. They vary somewhat in the numbers of atoms of water of crystallization, some being anhydrous, others containing as many as 12 equivalents. Sulphuric acid also forms acid bisalts, of which bisulphate of potash may be taken as an example, $KO.H_2O.2SO_3$. In a few instances, basic salts are formed; as, for instance, the basic sulphate of copper, $CuSO_4 5H_2O$. Sulphuric acid and its salts are recognized by giving a white precipitate with a soluble salt of barium, insoluble in nitric acid. Formula, H_2SO_4.

Sulphuric Ether (ethylic, vinic, or ordinary ether $(C_2H_5)_2O$), a colorless transparent liquid, of a pleasant smell and a pungent taste, extremely exhilarating, and producing a degree of intoxication when its vapor is inhaled by the nostrils. It is produced by distilling a mixture of equal weights of sulphuric acid and alcohol, and by various other means. Its specific gravity is 0.720. It is extremely volatile and highly inflammable; and its vapor, mixed with oxygen or atmospheric air, forms a very dangerous explosive mixture. It dissolves in 10 parts of water, and is miscible with alcohol and the fatty and volatile oils in all proportions. It is employed in medicine as a stimulant and antispasmodic. Ether, by its spontaneous evaporation, produces a great degree of cold, and is used in the form of spray in minor surgical operations for freezing the part, and thus rendering it insensible to pain. True sulphuric ether, known also as sulphate of ethyl $(C_2H_5)_2SO_4$, is an oily liquid of burning taste and ethereal odor, resembling that of peppermint. It is almost incapable of being distilled without decomposition, as at a temperature of about 280° it resolves itself into alcohol, sulphurous acid, and olefiant gas. See ETHER.

Sulphurous Acid, an acid formed by the union of an equivalent of sulphur with two of oxygen in a variety of ways, the most familiar being its production during the combustion of sulphur in the open air or in oxygen. The gas produced is endowed with the properties of a weak acid, and is the sole product of the combustion, provided the air or oxygen be perfectly dry. It has a pungent, suffocating odor, and when in a concentrated form cannot be breathed with impunity. It is not inflammable, and extinguishes burning bodies. It dissolves freely in water, which takes up between 40 and 50 times its bulk of the gas. The solution has the smell and taste of the gas itself, and becomes gradually converted into sulphuric acid from absorbing oxygen from the air. Crystalline hydrate, $SO_2 9HO$ and SO_2HO, may be obtained at a low temperature. The former melts at 40° F. Sulphurous acid gas is much used for bleaching straw and wool, the articles being moistened and suspended in a chamber in which sulphur is burning. It appears to act by forming a colorless compound with the coloring matter; for woolen goods which have been thus bleached become yellow on being washed with an alkaline soap. It is also used for preserving certain animal substances, such as vellum and catgut. It has also been employed as a disinfecting agent. At ordinary temperatures, sulphurous acid is a gas; but it may be readily condensed into a liquid by a pressure of three atmospheres, or by a freezing mixture of ice and salt. When the liquid acid is evaporated under the air pump, part of it solidifies from the cold produced. The liquid acid boils at 14 ° F.; and if poured into water, the cold produced by its reconversion into the gaseous state is so intense that the water is frozen. When required perfectly pure for laboratory purposes, sulphurous acid is made by the deoxidation of sulphuric acid. The mode generally adopted is to boil sulphuric acid with metallic copper of mercury, an equivalent of oxygen, leaving one portion of the acid to form an oxide with the metal. Sulphurous acid is a powerful reducing agent, liberating iodine from iodic acid, and precipitating tellurium and selenium from their acids. The sulphites are somewhat weak salts, presenting considerable analogy to the carbonates, the salts of the same metals being often isomorphous. With the alkalies it forms a double set of salts, containing respectively one and two equivalents of acids. Bisulphite of soda

was formerly much used to neutralize the excess of chlorine; and bisulphide of lime is extensively employed in the manufacture of sugar. The sulphates are readily formed by passing sulphurous acid gas through water in which the carbonate or oxide of the metal is dissolved or suspended. They are decomposed by nearly all the acids, with the exception of the carbonic and boric, with the liberation of sulphurous acid. The acid sulphates of baryta, strontia, lime, and magnesia, and the neutral and acid sulphates of the alkalies, are soluble in water. Most of the others are insoluble, and may be precipitated by the addition of a soluble sulphate to their solutions. Formula, SO_2.

Sulphur Oxides, in chemistry, sulphur forms two oxides, viz., sulphurous anhydride, SO_2, and sulphuric anhydride, SO_3. SO_2 is produced by burning sulphur in air or oxygen. At common temperatures it is a gas, but under a pressure of three atmospheres it is converted into a liquid, and, by the aid of a freezing mixture into semi-crystalline flakes. The solid, SO_2, melts at $-79°$, and the liquid oxide boils at $-10°$. Its sp. gr. $= 1.45$, and it is irrespirable and incombustible. Sulphuric oxide is obtained by the oxidation of sulphurous anhydride and crystallizes in beautiful white slender needles. In the liquid state it forms a liquid thinner than oil of vitriol. It boils at 35°, and has a sp. gr. of 1.97.

Sulpicians, a Roman Catholic congregation of missionary priests founded in 1642 at Paris by the Abbé Ollier. They have a number of houses in Europe and America, and are chiefly engaged in training young men for the priesthood. They are called Sulpicians from the parish of St. Sulpice, where the congregation was first organized.

Sultan, in Arabic, signifies "mighty one, lord." It is the ordinary title of Mohammedan rulers. The ruler of Turkey assumes the title of Sultan-es-selatin, "Sultan of sultans." The title sultan is also applied to the sultan's daughters, and his mother, if living, is styled Sultan Valide.

Sulu Islands, a group in the Indian Archipelago, consisting of more than 150 islands, which stretch from the N. E. point of Borneo to the Philippine Islands; total estimated area, 1,600 square miles. Sulu, the chief island, is lofty, and lies near the center of the group; pop. (1903) 44,718, mostly wild. The islands are of volcanic origin, and produce all kinds of tropical plants and trees. They are well watered, and enjoy an immunity from the hurricanes which ravage the neighboring islands. The inhabitants are of Malay descent, and nearly all profess the Mohammedan religion. There is a considerable trade between Sulu and Singapore in bêche-de-mer, pearl shells, birds'-nests, etc. The islands were ceded by Spain with the Philippines to the United States, Dec. 10, 1898.

Sumac (*Rhus*), a genus of shrubs of the natural order *Anacardiaccæ,* with pinnate leaves and small flowers. They all have a lactescent acrid juice, and most of them possess valuable tanning properties. More than 70 species are known. *R. coriaria* is found in the countries about the Mediterranean. Its roots contain a brown, and its bark a yellow dye. The leaves and seeds are used in medicine as astringent and styptic, and the leaves are exported for use in tanning, dyeing, and calico printing. *R. typhina* is an American species with hairy branches, hence its common name of stag s-horn sumac. It produces small red berries, and is cultivated in European gardens for ornament. *R. glabra,* another American species, is also grown for ornament, and its berries and branches are used for dyeing purposes. *R. venenata,* commonly called dogwood or poison sumac, is a shrub of the American swamps. It grows from 12 to 20 feet high, and produces greenish-white flowers. It is extremely poisonous, in some cases giving rise to inflammation of the skin followed by a pustular eruption. *R. radicans,* often called poison ivy, is a climbing variety. It affects certain individuals in the same manner as the poison sumac, but it is less virulent. The leaves of several of these species are now extensively collected in America for tanning and other purposes. The celebrated Japan varnish is obtained from a species of *Rhus* with downy and velvety leaves. The varnish oozes from the tree when wounded, and grows thick and black when exposed to the air.

Sumarokov, Aleksander Petrovich (sö-mär′-o-kov), a Russian playwright; born in Moscow, Russia, Nov. 23, 1718. His tragedy "Khorev" (1747) first attracted attention; it was followed by "Sinav and Truvor" and "Semira," which added to his fame. He also wrote comedies, odes, sonnets, madrigals, epigrams, and fables. He died Oct. 12, 1777.

Sumatra, an island in the Indian Seas immediately under the equator; separated from the peninsula of Malacca by the Straits of Malacca and from Java by the Straits of Sunda; greatest length about 1,000 miles; breadth, about 240 miles; area, 161,612 square miles; pop. (1906) 2,290,189. Banca and other islands adjoin the coast. The W. side of the island is mountainous, with peaks ranging in height from 2,000 feet in the S. to 5,000 feet further N.; and culminating in Indrapura, a volcano 12,572 feet high. The E. side spreads out into interminable plains. There are several volcanoes in the island. Copper, tin, and iron are found in abundance and deposits of coal exist. The chief rivers are the Rokan, Musi, Jambi, and Indragiri,

which all form extensive deltas at their mouths. Sumatra enjoys great equability of climate, but in many low-lying parts is unhealthy; rain falls almost incessantly in the S. Mangroves grow near the coast, and at higher elevations myrtles, palms, figs, and oaks of various species are met with. The camphor tree prevails in the N., and among vegetable curiosities are the upas tree and the gigantic rafflesia. Pepper, rice, sugar, tobacco, indigo, cotton, coffee, are cultivated for export, and camphor, benzoin, catechu, gutta-percha and caoutchouc, teak, ebony, and sandalwood are also exported. The fauna includes the elephant, the tapir, the rhinocerous, the tiger, the ourang-outang and other apes, some species of deer and antelope, and numerous birds and reptiles. Of the domestic animals the chief is the pig, next to which rank the cow and the horse.

The island is for the most part under the authority of the Dutch, and their possessions are divided into six governments. The most important native state is ATCHEEN (*q. v.*), in the extreme N. of the island. Sumatra has a very mixed population consisting of Malays, Chinese, Arabs, and many native tribes. The Battas are a peculiar and interesting race approaching the Caucasian type. Writing has been known among them from a very early period and their ancient books are written in a brilliant ink on paper made of bark. The native tribes of Sumatra have no temples and no priests, but a form of Mohammedanism prevails among the Malays on the coast. Chief towns, Palembang and Padang.

The Dutch acquired their territories in Sumatra in the 16th and 17th centuries. The British formed a settlement at Benkulen in 1685, and in 1811 seized the Dutch possessions on the island. These were restored in 1815, and by treaties in 1834 and 1871 the Dutch were allowed the right to enlarge their territories by treaty, or by conquest and annexation. The tidal wave accompanying the volcanic eruption of Krakatoa in 1883 caused great destruction on the S. coast of Sumatra.

Sumatran Broadbill, in ornithology, the *Corydon sumatranus,* from Borneo and Sumatra. Little is known of its habits, except that it frequents moist and shady places and associates in small groups.

Sumatran Monkey, in zoölogy, the *Semnopithecus melalophos,* from the forests of Sumatra. Male brilliant yellow-red above, face blue, a tuft of black hairs on the face in the shape of a bandeau.

Sumatran Rhinoceros, in zoölogy, the *Rhinoceros (Ceratorhinus) sumatrensis.* It is the better known of the two-horned Asiatic species. There are two obtusely-pointed horns, the body is covered with bristles, and the folds of the skin are deep.

Sumbawa, one of the chain of the Sunda Islands to the E. of Java; between Lombok (on the W.) and Flores (on the E.); area, 5,192 square miles; pop. about 150,000, all Malays and Mohammedans. They are divided between four native rulers, who owe allegiance to the Dutch governor of Celebes. The islands are mountainous but fertile, and yield rice, tobacco, cotton, sandalwood, etc. In 1815 an eruption of Tambora, the loftiest peak on the island, whereby the altitude was decreased from 14,000 to 7,670 feet, depopulated the kingdoms of Tambora and Papekat, 12,000 lives being lost and great damage done to the whole island by the ashes. Another eruption took place in 1836, and one of another peak, Gunong Api in 1860, though with little loss.

Sumbulpur, the chief town of the district of the same name in the Central Provinces of British India; on the left bank of the Mahanuddi river; 340 miles E. of Nagpur. The town has been much improved. It contains several old temples. The district of the same name, which occupies the extreme E. of the Central Provinces, has an area of 4,407 square miles. The only manufacture is the weaving of tussar-silk cloth. The climate is unhealthy. Sumbulpur forms the center of a numerous group of feudatory States, of which Kharond is the chief. The direct line of the old Rajahs of Sumbulpur expired in 1849, when the country was annexed.

Summary Proceeding, in law, a term used of a form of trial in which the ancient established course of legal proceedings is disregarded, especially in the matter of trial by jury. In no case can a party be tried summarily unless when such proceedings are authorized by legislative authority, as in a committal for contempt of court, the conviction of a person by justices of the peace, etc.

Summer, that season of the year when the sun shines most directly on any region; the warmest season of the year. N. of the equator it is commonly taken to include the months of June, July, and August; though some substitute May, June, and July. The former view conforms better to fact. July, which by this arrangement is midsummer month, is the hottest in the year, for though the maximum of heat is obtained on June 21, the longest day, the amount received for many subsequent days is greater than that lost by radiation, and the temperature continues to increase. Summer is the appropriate season for the hay harvest and for the ripening of the earlier fruits. Astronomically considered, summer begins in the Northern Hemisphere, when the sun enters the sign of Cancer about June 21, and continues till Sept. 23, during which time he passes through

Cancer, Leo, and Virgo. In the Southern Hemisphere the opposite is the case, it being winter there when it is summer here, and vice versa. During the astronomical summer of the Southern Hemisphere the sun passes through Capricorn, Aquarius, and Pisces.

Summer Capital of the United States, a former popular designation of Long Branch, N. J.; latterly of Beverly, Mass.

Summer Duck, the *Aix* (*Dendronessa*) *sponsa*. The drake is about 18 inches long, and has very beautiful and brilliantly-colored metallic plumage. The summer duck is a native of North America, and in the breeding season is distributed over the United States, migrating S. in winter. It is capable of domestication. Called also wood duck, from its habit of nesting in holes in trees.

Summering, in architecture, in cylindrical vaulting, the two surfaces intersecting the intrados of a vault in lines parallel to the axis of the cylinder. In conic vaulting, where the axis is horizontal, the two surfaces which, if produced, would intersect the axis of the cone.

Summist, one who forms an abridgment or summary; a summarist. In Church history, a name given to the scholastic divines of the Middle Ages, who propounded their dogmas in works called "Summæ Theologiæ" (Heads of Theology). This name was first adopted from the "Summa Universæ Theologiæ" of Alexander Hales (died 1245), whose renown was eclipsed by that of Albertus Magnus (died 1280), in his turn surpassed by his disciple, St. Thomas Aquinas (1224–1274), who published his celebrated work on divinity under the title of "Summæ Totius Theologiæ."

Summons, in law, a writ commanding the sheriff, or other authorized officer, to notify a party to appear in court, to answer a complaint made against him, and in the same writ specify some day therein mentioned.

Sumner, Charles, an American statesman; born in Boston, Mass., Jan. 6, 1811; was educated at Harvard University. In 1834 he was called to the bar, and shortly afterward became reporter of the United States Circuit Court. In 1836 he published three volumes of Judge Story's decisions, subsequently known as "Sumner's Reports," and edited a periodical called the "American Jurist." He visited Europe in 1837, and returned to Boston in 1840 where he resumed his legal practice. Between 1844 and 1846 he edited and published "Vesey's Reports" in 20 volumes. In 1851 he was elected to the Senate of the United States and distinguished himself by his strong antipathy to slavery. In May, 1856, after delivering a speech vigorously attacking the slaveholders, he was violently assaulted by Preston S. Brooks, congressman from South Carolina. His injuries compelled him to absent himself from public duties for nearly four years. He was a supporter of Lincoln and Hamlin, and in 1861 he became chairman of the Senate Committee on For-

CHARLES SUMNER.

eign Relations. He was an enemy to the policy of President Johnson and opposed the home and foreign policy of President Grant. After the latter's reëlection in 1872 Sumner seldom appeared in debate. He died in Washington, D. C., March 11, 1874.

Sumner, Charles Allen, an American lawyer; born in Great Barrington, Mass., Aug. 2, 1835; received an academic education; and was a member of Congress in 1883–1885. Afterward he was editor of several newspapers, including the San Francisco "Mirror", the Sacramento "Sentinel", the San Francisco "Herald", etc.; became a lecturer on "Cremation", "Scenes and Incidents in Foreign Lands"; etc. His publications include "A Government Postal Telegraph" (1870); "Compilation of Speeches in Congress and Elsewhere, on a Genuine Postal Telegraphy" (1870); "Poems" (1877); "Shorthand and Reporting" (1882); "Golden Gate Sketches" (1884); "Notes of Travel in Sweden" (1885); "Cremation" (1900); etc. He died in 1903.

Sumner, Edwin Vose, an American military officer; born in Boston, Mass., Jan. 30, 1797. He was a captain in the Black Hawk war; served with distinction in the Mexican war in 1846–1847, especially at the battles of Cerro Gordo and Molino del Rey; was made major in 1846; governor of New Mexico in 1851–1853; in 1855 was made colonel and was one of the escort of Abraham Lincoln from Springfield, Ill., to Washington, D. C., in February, 1861; in

March, 1861, promoted Brigadier-General U. S. A. During the Civil War he commanded a corps at the battle of Fair Oaks May 31-June 1, 1862; at Malvern Hill July 1, and at the battle of Antietam Sept. 17 of that year; he also commanded one of the three great divisions of Burnside's army at the battle of Fredericksburg Dec. 13, 1862; was given command of the Department of the Missouri in 1863. He died in Syracuse, N. Y., March 21, 1863.

Sumner, George Watson, an American naval officer; born in Constantine, St. Joseph co., Mich., Dec. 31, 1841; was appointed to the navy in 1858 and attended the United States Naval Academy till 1861. In the Civil War he took part in the bombardment of Forts Jackson and St. Philip; commanded the "Massasoit" on the James river, and with the "Onondaga," forced the Confederate ironclads to relinquish the purpose of attacking Grant's transports and base of supplies at City Point, Va. After the war he served in various capacities, was commandant of the Naval Station, Port Royal, S. C., in 1899–1901; and in January, 1901, was appointed commandant of the Philadelphia Navy Yard and Station.

Sumner, John Bird, an English prelate; born in Kenilworth, Warwickshire, England, in 1780; was educated at Eton and Cambridge, where he took high honors. He entered the Church and became rector of Mapledurham. In 1820 he was made Canon of Durham, in 1828 Bishop of Chester, and in 1848 Archbishop of Canterbury. His works include: "The Evidences of Christianity" (1824); "Lectures on the Gospels and Epistles" (1831–1840); and "Practical Reflections" (1859). He died in London Sept. 6, 1862.

Sumner, Samuel Storrow, an American military officer; born in Pennsylvania, Feb. 6, 1842; was appointed to the army from New York in 1861; served with distinction during the Civil War, and against hostile Indians in the campaign of 1869. In May, 1898, he was appointed a Brigadier-General of volunteers and in the American-Spanish War, was assigned to duty in Cuba where he took part in the Santiago campaign. He was mustered out of the volunteer service in 1899, and ordered to England as military attaché, but left there in 1900 to join the United States troops in China. Later he was sent to the Philippines, where he was placed in command of the 1st district of Southern Luzon. He was promoted Brigadier-General U. S. A., Feb. 4, 1901.

Sumner, William Graham, an American political economist; born in Paterson, N. J., Oct. 30, 1840; was graduated at Yale in 1863; studied at Geneva, Göttingen, and Oxford; was tutor at Yale in 1866–1869; in 1867 took orders in the Protestant Episcopal Church; was assistant at Calvary Church, New York, and rector of Church of the Redeemer, Morristown, N. J.; appointed Professor of Political Economy and Social Science at Yale College in 1872. His writings include a translation of Lange's "Commentary on Second Kings" (1872); "History of American Currency" (1874); "Life of Andrew Jackson" (in "American Statesmen" Series, 1882); "What Social Classes Owe to Each Other" (1883); "Problems in Political Economy" (1884); "History of Banking in the United States" (1896); etc. He died April 12, 1910.

Sumptuary Laws, laws intended to repress extravagance, especially in eating and drinking, and in dress. They were common in ancient times, and also appear in the old statute books of most modern nations. They were more frequently enacted in ancient Rome than in Greece. After the Twelve Tables, the first Roman sumptuary law was the Lex Oppia (215 B. C.), directed exclusively against female extravagance in dress, jewelry, etc. The other Roman laws of this kind were nearly all designed to suppress extravagance in entertainment. The Lex Julia (Julian Law), the last sumptuary law was passed in the reign of Augustus. Sumptuary laws were revived by Charlemagne, and in France various laws and decrees of a similar nature were passed down to the reign of Louis XV. In England these laws were passed from the reign of Edward III. down to the time of the Reformation. Most of them were repealed by an act James L. but they were not all expunged from the statute book till 1856. Sumptuary laws were also passed by the ancient Scotch legislature, but they were all repealed, evaded, or neglected. As late as 1883 in Montenegro strong laws were passed against gloves, umbrellas, and non-national costumes. Neither in England, Scotland, nor France do sumptuary laws appear to have been practically observed to any great extent; in fact, the kings of France and England contributed far more, by their love of pageantry, to excite a taste for luxury among their subjects than by their ordinances to repress it. Froude has suggested that such statutes may have been regarded, at the time when they were issued, rather as authoritative declarations of what wise and good men considered right than as laws to which obedience could be enforced. Enactments of this kind have long been considered to be opposed to the principles of political economy.

Sumter, Thomas, an American military officer; born in Virginia in 1734. He was distinguished for his skill and success as a partisan leader and was known among his followers as the "Carolina gamecock." In the early part of the Revolutionary War he was lieutenant-colonel of a regiment of

South Carolina riflemen, but after the capture of Charleston in 1780, he was made a Brigadier-General of light cavalry. He gained several victories over the British troops, but in September, 1780, was defeated by General Tarleton. Ten days later he defeated the British general in turn, being himself dangerously wounded. In the spring of 1781 he again began active service and took a distinguished part in the battle of Eutaw Springs. The thanks of Congress were tendered him in 1791, and he was afterward sent to that body as a representative of South Carolina. In 1809 he was appointed United States minister to Brazil and two years later was elected United States Senator from his native State. At the close of his term he retired to private life, and died near Camden, S. C., June 1, 1832.

Sumter, Fort (named after Gen. Thomas Sumter, 1734–1832), an American fort associated with both the beginning and the end of the Civil War; built of brick, in the form of a truncated pentagon 38 feet high, on a shoal, partly artificial, in Charleston Harbor, 3½ miles from the city. On the withdrawal of South Carolina from the Union in December, 1860, Major Anderson, in command of the defenses of the harbor, abandoned the other forts, and occupied Fort Sumter, mounting 62 guns, with a garrison of some 80 men. The attack on the fort was opened by General Beauregard April 12, 1861, and it surrendered on the 14th; this event marked the beginning of the war. The Confederates strengthened it, and added 10 guns and 4 mortars. In April, 1863, an attack by a fleet of monitors failed. In July batteries were erected on Morris Island, about 4,000 yards off, from which in a week 5,000 projectiles, weighing from 100 to 300 pounds, were hurled against the fort; at the end of that time it was silenced and in part demolished. Yet the garrison held on amid the ruins and in September beat off a naval attack; and in spite of a 40 days' bombardment in October–December, 1863, and for still longer in July and August, 1864, it was not till after the evacuation of Charleston itself, owing to the operations of General Sherman, that the garrison retired, and the United States flag was again raised April 14, 1865; an event soon followed by the evacuation of Richmond and the Confederate surrender.

Sun, the center of our solar and planetary system, and one of the stars in the boundless sidereal universe. It is a hot self-luminous globe of enormous dimensions as compared with any of its planets, and the source from which they derive their heat and whatever life they bear; but considered as a star it is probably only of moderate dimensions and brilliancy.

Distance and Dimensions.—Its mean distance from the earth is about 93,000,000 miles, probably a little less, a distance which a fast railroad train would traverse in about 250 years, sound (with its terrestrial atmospheric velocity) in about 14 years, a cannon-ball at 1,700 feet per second in about nine years, and which light flies over in about 500 seconds. Its diameter is about 866,500 miles, nearly 110 times that of the earth. With the earth at its center it would take in the whole moon's orbit and have plenty of room for another moon one and three-quarter times as far out as ours and still far inside its surface. Reducing the scale so as to represent the sun by a globe 2 feet in diameter, the earth would be less than ¼ inch in diameter and about 220 feet away, while the distance of the nearest fixed star on this scale would

CORONA OF THE SUN.

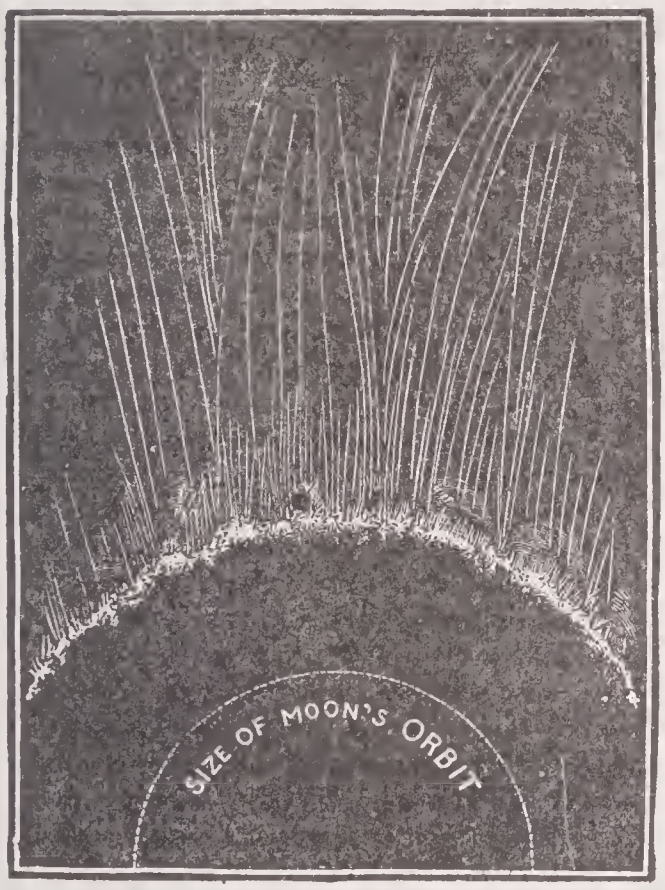
be about 8,000 miles or the actual diameter of the earth. The surface of the sun is about 12,000 times that of the earth, and its volume about 1,300,000 times.

Mass, Gravity, etc.— The mass of the sun is only about 332,000 times that of the earth, so that its density is only a little over a quarter of the earth's, or about 1.41 times as heavy as water. It is well to keep this in mind in thinking of the probable physical condition of the sun, when we remember that it is largely composed of iron. The attraction of the sun at its surface is about 27.6 times that of the earth at its exterior, so that a 200-pound man would weigh about 5,520 pounds on the sun, a body would fall about 444 feet in a second, instead of 16, as here, and a pendulum which marks seconds here would vibrate more than five times per second there.

Rotation and Axis.— The motion of the spots across the sun from E. to W. shows that the huge globe rotates regularly on an axis in a period of about 25.3 days, or rather this is the velocity at the solar equator. On each side the speed is slower, till in latitude 40° the period is more than 27 days.

Much beyond this the rotation time is unknown, for the spots seldom extend beyond latitudes of 45° N. or S. The cause of this equatorial acceleration is as yet unexplained. The path of the spots also shows that the sun's equator is inclined to the plane of the ecliptic at an angle of about 7° 15′, and that its axis points very nearly to a point half way between the stars *a* Lyræ and Polaris.

Photosphere.— The luminous surface of the sun directly visible in telescopes is called the photosphere, (Greek *phos*, "bright.") It is probably a sheet of luminous clouds



IDEAL SECTION OF THE SUN.

The back disk represents the inner nucleus; the white ring surrounding it is the photosphere, rising at points into faculæ, and depressed at others in spots; immediately above lies the so-called "reversing stratum," in which the lines (called "Fraunhofer," after the discoverer) originate; above this is the scarlet chromosphere, with prominences of various forms and dimensions; and over, and embracing all, is the coronal atmosphere fading gradually away into darkness. In its study with reference to magnitude, imagine the earth as a mere dot placed in the middle of the bottom line and at the center of the moon's orbit.

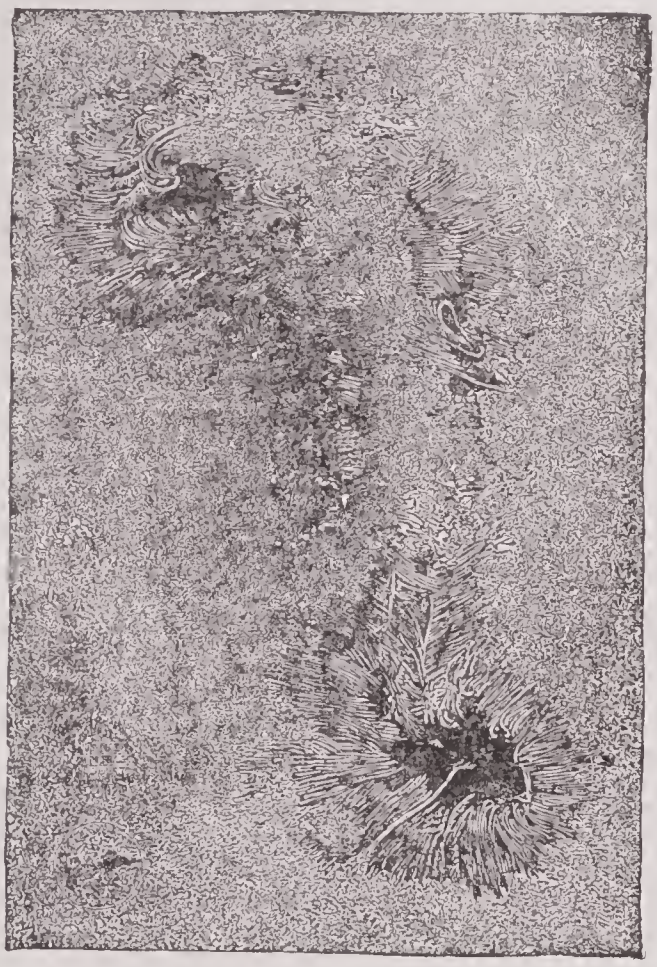
formed by the condensation of substances which exist as gases in the hotter central mass of the sun. Under a moderate magnifying power it looks like rough drawing paper. With higher powers it looks something like snow flakes scattered over gray cloth. These flakes or grains are from 400 to 600 miles across, and are probably bright clouds floating in an atmosphere not so luminous. Near the edge of the sun the photosphere is much less brilliant than at the center, due to absorption of the solar atmosphere.

Spots and Faculæ. — The most prominent feature of the sun's surface is the spots, some of which can almost always be seen except near the time of a sunspot minimum. They are dark depressions in the photosphere, and consist of a central umbra with surrounding penumbra which is not so dark. This penumbra consists of radial filaments, and appears like the sloping sides of the sunspot cavity, as if the photosphere were drawn down into the spot by inward currents. In the central umbra there are also sometimes smaller, darker spots, called "Dawes's holes," from the name of their discoverer. The preceding is the description of what may be called a normal spot before it begins to break up; but they are seldom of so regular a character. Frequently there are several umbræ with a common penumbra, and there are sometimes streaks or "bridges" of the bright photosphere extending clear across the whole spot. The umbra is not always central, and the filaments of the penumbra are frequently twisted and curled into the most fantastic shapes, reminding one of swirling tongues of flame or smoke. The diameter of the umbra of a spot ranges all the way from 500 to 50,000 or 60,000 miles. The whole earth could be dropped into many of them without disturbing the edges. The penumbra surrounding some of the larger groups of spots has sometimes measured as much as 150,000 miles in diameter. The depth of the umbra below the general surface of the photosphere is difficult to determine, but according to the best authorities may range from 500 to 2,500 miles. Surrounding the spots there are generally streaks of the photosphere which are much brighter than its general surface, sometimes extending nearly radially from the spot, and these are called the faculæ, (Latin *fax*, "a torch"). They are elevated ridges of the photosphere, and are much more prominent when near the edge of the sun, where they project up through a part of the atmosphere which dims the general photospheric level. The faculæ are not confined to the spot surroundings, but they are much more abundant there. They probably mark surgings or upheavals, which are the surrounding accompaniment of sunspot action.

Life and Distribution of Spots.— They begin from insensible points, rapidly growing larger, but generally do not develop the penumbra till after the umbra is well formed. The projection of a bright streak, or facula, across the nucleus of a spot often precedes its segmentation or breaking up into two or more. When a spot disappears it comes about by the encroachment of the photosphere, which seems to fall into and fill the cavity, leaving its place covered by a group of bright faculæ. In the vicinity of a spot the motion of phosphoric and other matter is generally inward, toward and

down into the center, and occasionally the latter is enough to be detected by the spectroscope. The duration of a spot ranges from a few days to occasionally more than a year, but is generally a month or two. It is a remarkable fact that their distribution is confined to two zones between 5° and 40°.

Theories of Sunspots.— The cause of spots is not yet satisfactorily made out, and among the many theories offered we can only note that of Faye, who considers them to be cyclonic, like our terrestrial storms, caused by the forward drift of the equatorial photosphere, and the more probable suggestion of Young that they are depressions or sinks in the photosphere brought about by the diminution of pressure below,



SUNSPOTS.

which would accompany eruptions in the surroundings of the spot, the cooler, darker gases flowing down into the cavity thus formed. Certain it is that they are intimately associated with eruptions and explosions on the surface or from below, but which is cause and effect, or whether both spot and eruption are caused by some outside influence (like the fall of meteoric matter) is as yet undetermined.

Periodicity of Spots.— The spots have, roughly speaking, a period of about 11 years, but it is very irregular and has not as yet received any satisfactory explanation. At the time of maximum the surface is never free from them, while at minimum none may be in sight for weeks at a time.

Effect on the Earth.— The only certain connection between the spots and terrestrial phenomena is that with the earth's magnetism. The range of magnetic disturbance, or storminess, follows the sunspot curve very closely, and individual outbursts on the sun are frequently accompanied by simultaneous "magnetic storms" and brilliant exhibitions of the Aurora Borealis on the earth. The exact mechanical connection between the two is not yet known, but of its reality there is not the slightest doubt. Endless attempts have been made to connect almost every other phenomenon of terrestrial meteorology with the sunspot period, but with the single exception above mentioned none has been satisfactorily established.

Young's Reversing Layer.— Next above the photosphere comes a stratum of unknown thickness, discovered by Professor Young, containing the vapors of many of our terrestrial elements. At the time of a total eclipse, if the slit of a spectroscope is kept just tangent to the disappearing limb of the sun, at the instant of the disappearance of the bright light from the photospheric background the light from this layer flashes out in the spectrum in the shape of bright lines, probably where the dark lines had before been. The point as yet unsettled is whether all the dark lines are thus reversed, and with their relative intensity. Lockyer claims that this so-called layer is of a considerable height, and that at different heights in it, different lines, or the same lines with different intensity, will appear, in accordance with his theory that in the sun our chemical elements are dissociated and float at different levels in the solar atmosphere. This is one of the points to be settled by observation at future eclipses.

Chromosphere and Prominences or Protuberances.— Above the reversing layer and interpenetrating it, or possibly identical with it, if Lockyer's theory should prove true, is an atmosphere of permanent gases called the chromosphere. Hydrogen is the most abundant of these gases, and out of this chromosphere rise the wonderful prominences or protuberances which form so prominent a feature of the sun's surroundings at the time of a total eclipse, and which can be investigated by the spectroscope at any time as they consist almost wholly of hydrogen. They are of all imaginable fantastic shapes, and frequently rise, and are sometimes seen to be rapidly projected to the height of several hundred thousand miles, and at enormous velocities. In such case they are almost always seen to be connected with some active sunspot, and they are unquestionably the results of the uphcavals, eruptions, or explosions accompanying the surroundings of the spots The chromosphere itself all along the limb of the sun, as seen in the hydrogen lines in the spectrum, is not a smooth, flat layer;

but consists of filaments like upward tongues of flame, and has been compared to the appearance of a "prairie fire," though there is no actual combustion going on.

Spectrum and Constitution.— Almost all our knowledge of the constitution of the sun has been revealed to us by the spectroscope. It has shown us that not only do many of our so-called chemical elements exist in the sun, but that its temperature is so high that they exist there in the form of gases. Among the elements identified are hydrogen, iron, titanium, calcium, manganese, nickel, cobalt, chromium, barium, sodium, magnesium, and platinum, with a strong probability in favor of copper, palladium, vanadium, molybdenum, uranium, aluminum, cadmium, carbon, and lead. With the exception of carbon all the above are metals. (Hydrogen in its chemical relations ranks as a metal.) A few years ago it was considered that the late Dr. Henry Draper had shown the strong probability of the existence of oxygen in the sun, but the later investigations, while not decisive, tend to negative this conclusion. In this connection Mr. Lockyer's views must be mentioned. He considers that none of our so-called chemical elements are truly elementary, but that they may all be decomposed into simpler constituents, and that many of them are so dissociated in the sun and the stars. The matter is still one of the most important unsettled questions in the domain of astro-physics. A full exposition of his views may be found in his "Chemistry of the Sun." The revelations of the spectroscope in regard to the chromosphere, prominences, and so-called reversing layer have already been briefly mentioned. It has also been instrumental in revealing the enormous velocities accompanying explosions, and eruptions on the sun. At the limb of the sun we see these revealed by the telescope directly in the huge hydrogen prominences, but the spectroscope shows another component of this velocity in the direction to or from us in the line of sight. In the spectrum of a spot, and of the faculæ round it, the lines are frequently broken and twisted into remarkable shapes, indicating motion to or from us of the gases in question at enormous velocities. In some cases hydrogen has been shown to be rushing toward us with a velocity of 300 miles per second. Occasionally the spectrum of the nucleus of a spot has shown a downrush of matter into the cavity.

The Solar Corona.— Surrounding all other parts of the solar surface rises the halo of light called the corona, which is only visible at the time of a total eclipse. Though known from the remotest times, little is yet known of its cause or physical condition, and it is the principal object of attack now at the time of every eclipse of

Sun

the sun. Down near the surface it is very bright and of a pearly or greenish color. Above this it rises, especially at the poles, in short, finely clustered filaments. Over the suns potzones it generally rises higher in broad streaks, and at times extends out nearly in the direction of the ecliptic in faint streaks looking like gauze wings on the sun. These fade out gradually, and their limit to the eye or the photographic plate is fixed by the brightness of the sky background. Up in the clear air of Pike's Peak, Col., in 1878, these streamers were seen extending at least 9,000,000 miles from the sun. It varies much at different eclipses and is never twice alike, though certain typical forms seem to follow somewhat the maxima and minima of the sunspot period. The total light of the corona is at least two or three times that of the full moon. As its light appears to be relatively rich in the ultra violet part of its spectrum, Dr. Huggins has attempted to photograph it in full sunshine, but thus far it is somewhat doubtful if he has succeeded in this. The spectrum of the corona consists principally of a bright line in the green which has not been identified with that of any terrestrial element, and for which the name coronium has been proposed. The lines of hydrogen are also visible, but not so bright by far as the line in the green. There is also a faint continuous spectrum, and some observers have claimed to see on this the faint absorption lines of the solar spectrum. The nature of the corona is one of the most puzzling things to explain. It cannot be an atmosphere in any sense of the word, as the gaseous pressure there must be less than that of the most perfect vacuum we can make. Comets sweep through it without hindrance. It is a product of some sort of the enormous forces at play in the vicinity of the sun. Meteoric matter, cometic matter, matter ejected from the sun, are probably all concerned in it, and possibly electricity may play some part in the display. It is possible, and indeed perhaps probable, that the zodiacal light which reaches far out toward and perhaps beyond the earth's orbit, is a faint extension of the equatorial coronal streamers.

Radiation.— Compared with other familiar sources of light we find that the amount of it received from the sun is about 600,000 times that from the full moon, 7,000,000,000 times that from Sirius, 40,000,000,000 times that from Vega or Arcturus, and 1,575,000,000,000,000,000,000,000,000 times as much as a standard candle would give at the distance of the sun. The intrinsic brightness of its disk is about 90,000 times that of a candle flame, 150 times that of the lime in a calcium light, and from two to four times as bright as the brightest spot in the crater of an electric arc light. The darkest part of a sunspot is brighter than

Sun

the lime light. The brightness of the sun's surface near the edge of the disk is only about one-third that at its center and is of a brownish-red color. This makes it appear still fainter at the edge of a photograph of the sun. If the sun were stripped of its atmosphere it would probably shine from two to five times as brightly as at present, and would be of a decidedly blue color. Considering solar radiation in its heating effect and measuring it in terms of its power to melt ice, we find that the total amount of heat received annually would melt a sheet of ice 174 feet thick at the equator, or 136 feet thick over the whole surface of the earth if the radiation were equally distributed in all latitudes. Converted by means of the mechanical equivalent of heat and expressed as energy, we find that, neglecting the absorption of our atmosphere, each square meter of the earth's surface would receive from an overhead sun about two and one-third horse power continuously. Atmospheric absorption cuts this down to about one and a half horse power. Transferring ourselves from the surface of the earth to that of the sun, and considering the radiation per unit of surface there, the figures are enormous, and the energy in question is almost incomprehensible. Every square meter of the sun's surface is continuously radiating more than 100,000 horse power. A shell of ice 50 feet thick would there be melted in one minute. To keep up such a development of heat by combustion would require that a layer of the best anthracite coal over the whole surface from 16 to 20 feet thick should be burned each hour, a ton an hour for every square foot of surface, at least nine times as much as the consumption of the most powerful blast furnace per foot of grate surface. At this rate the sun, if made of solid coal, would not last 6,000 years. Of this enormous amount of energy, so far as we know, only about .000,000,001 is intercepted and utilized by all the bodies of the solar system, and to the best of our knowledge, and according to human ideas, the rest of it goes to waste.

Temperature.— While we can measure with a fair degree of accuracy the amount of solar radiation, the determination of the actual temperature of its surface is a very different matter. All that can with certainty be said is that it is much higher than any temperature that can be produced by terrestrial means. The various estimates have taken the widest possible range, depending on the assumed law connecting radiation with temperature. The most reliable estimates place the probable effective temperature as something like 10,000° C., or 18,000° F. There must also be a considerable range of temperature at different depths below its surface.

Sources of Energy.— We have noted the tremendous expenditure or energy by the sun in the form of radiation. A natural question is, How does it keep it up? We have mentioned the insufficiency of any combustion hypothesis. The only others worth mentioning are the meteoric and the contraction theories, as it can easily be shown that the theory of a cooling sun will not suffice, since, if this were the source of its radiant energy, it must have cooled enough within historic times to have affected very decidedly its radiating power. The meteoric theory attempts to account for the keeping up of its supply of energy by the fall of meteoric matter into the sun. A body falling into the sun from any considerable distance will generate by the sudden arrest of its energy of translation an enormous amount of heat, 6,000 times as much as would be generated by its complete combustion if it were a mass of pure carbon. From the fact that meteors are constantly striking the earth we know that they must be all the time falling into the sun, but nevertheless the greater part of the meteoric matter in the vicinity of the sun must circulate round it as the comets do. The most careful estimates seem to indicate that only a very small fraction of the sun's radiant energy can come from the fall of meteors into it. The only sufficient theory left is that of Helmholtz — the contraction hypothesis. Without going fully into the explanation of this it may be briefly stated that, supposing the bulk of sun to be mainly gaseous, a contraction of about 250 feet per year in its diameter would supply all its present rate of radiation. At this rate it would take nearly 10,000 years to diminish its apparent diameter by a single second of arc, and it is doubtful if this amount could be certainly determined with our present means of measurement of this diameter.

Age and Duration.— Every thing points to the conclusion that the present condition of the sun is mainly gaseous, and its future supply of heat depends on that condition. The contraction can only keep up its temperature so long as it is principally in a gaseous state. As soon as any large part of its bulk liquefies (only the thin shell of photospheric clouds is now supposed to be in a liquid condition), it will begin to cool off and its temperature will fall. This means the beginning of the end for life on the earth. The best estimates place this time as not more than 5,000,000 to 10,000,000 years off at the longest. The past history of the sun is involved in about the same obscurity as the nebular hypothesis. Certain data can not be furnished with exactness. Knowing the mass of the sun, we can compute how much heat has been generated in its condensation from infinite space or from any assigned dimensions; but as to

the rate at which this heat has been radiated in the past ages, and the rate at which contraction has taken place, nothing definite can be stated. It may be considered that the age of the solar system is entirely unknown.

Sun, City of the. See BAALBEK.

Sun, Eclipses of the, caused by the moon coming between the earth and the sun, may be either partial, total, or annular. In a partial eclipse the observer is situated in the penumbra of the moon's shadow, and only a part of the sun's light is cut off on one side. In a total eclipse the observer is in the umbra of the moon's shadow, and all the light of the sun is cut off except that from the prominences and corona surrounding the sun. In an annular eclipse the disk of the moon is wholly projected on that of the sun, but is not large enough to cover it completely, so that a ring of sunlight is left all round the moon. The apparent diameters of the sun and moon are so nearly equal that their variations with their varying distances make a central eclipse sometimes total and sometimes annular. In fact, the same eclipse may be total for some parts of the earth where the sun and moon are near the meridian at the time, and annular for other parts where they are low down in the E. or the W. at the time of central phase. In the annular eclipse the observer, instead of being in the cone of the moon's shadow, is in the prolongation of that cone, beyond its apex, in the other nap of the cone. At present the only scientific importance of partial and annular eclipses is the use that may be made of them for determining the relative positions of the sun and moon, and thus correcting the elements of the terrestrial and lunar orbits. But the fleeting minutes of every total eclipse are now utilized so far as possible to study the sun's surroundings, especially the mysterious corona, which is so faint that it is only visible when the bright light of the photosphere is cut off (see SUN). Geometrically considered, a solar eclipse is only an occultation of the sun by the moon, like that of any other heavenly body by the moon in its motion across the heavens.

Sun, Land of the. See LAND OF THE SUN.

Sun, Parallax of the, or **Solar Parallax,** the angle subtended by the radius of the earth at a distance equal to that of the earth from the sun. More exactly, it is the angle subtended by the equatorial radius of the earth at the mean distance of the sun, though this would be called, when speaking exactly, the mean equatorial horizontal parallax of the sun. It is, as nearly as we know it today, almost 8.8″, with an uncertainty of probably not more than 0.01″ or 0.02″ different from this in either direction. This corresponds to a distance of the sun a little less than 93,000,000 miles. More time, labor, and money have been expended in the determination of the solar parallax than of any other astronomical constant, on account of its importance in giving us an accurate base line with which to gauge the solar system and then strike out into the depths of stellar space. Before the last transit of Venus it was thought that careful observation would give an exceedingly accurate value of this constant; but these hopes were disappointed, and it is known that we have at hand at any time more accurate methods of determining the distance of the sun than from any possible observation of a transit of Venus. The most accurate direct method is likely to be the direct measurement of the parallax of the nearer and brighter asteroids by the HELIOMETER (*q. v.*).

Sun Animalcule, in zoölogy, the actinophrys. It consists of a small bit of globular protoplasm, with spines radiating in every direction from its surface; and when seen in perfect condition for the first time under the microscope with proper illumination it seems to shine like "the sun in its brightness." Hence the original observers gave it the name of the sun animalcule. Indeed, any old ordinary picture of the sun would do very well for Actinophrys, as conveying a general idea of its form.

Sunart, Loch, an inlet in Scotland, in the W. of Argyleshire, opening into the Sound of Mull. It is about 20 miles long, and varies in breadth from less than ½ mile to 3 miles.

Sun Bear (*Helarctos*), a sub-genus of the genus *Ursus*, comprising bears found in India and the Eastern Archipelago. The Thibetan sun bear (*H. thibetanus*) is a black species with a white patch on the breast. The Bornean sun bear (*H. eurysypilus*) has an orange-colored patch. The Malayan sun bear or bruang is a very small species. (See BEARS.) All the sun bears are slenderly made, and their fur is not so heavy and thick as that of the other bears.

Sun Bird, a popular name for any of the *Nectariniidæ*, divided by Capt. G. E. Shelley into two sub-families, *Nectariinæ* and *Promeropinæ*, the former containing the sun birds proper, and the latter the long-tailed sun birds. They are found over the whole of Africa, ranging through Palestine to India, thence through the Indian and Malayan Islands to Northern Australia, where a single species inhabits Cape York peninsula and Northern Queensland. They are small birds, in nearly every case of brilliant and metallic plumage, with a striking external resemblance to humming birds, with which they are not infrequently confounded, but differing from them in the

structure of the feet and tongue, the shape of the sternum, and other important characteristics. They feed chiefly on insects, small berries, and fruit, and sip the juices of flowers, and from this habit the name of the type genus (*Nectarinia*) is derived. The majority of the sun birds build nests of an oval form, suspended from the branch of a tree at a considerable height from the ground, so as to be out of the reach of serpents and lizards.

Sun Bittern, in ornithology, the *Eurypya helias,* from the N. parts of South America. It is about 16 inches long; body small and thin, neck long and slender, head like that of a heron, with a long, powerful beak compressed at the sides and slightly arched at the culmen; the plumage is minutely varicgated with bars and spots of many colors. It is often made a pet by the Brazilians, who call it pavao (=peacock), whence it is sometimes called the peacock heron.

Sunbury, a borough and county-seat of Northumberland co., Pa., on the Susquehanna river, and on the Pennsylvania, the Northern Central, and the Philadelphia and Reading railroads; 56 miles N. of Harrisburg. It is an important shipping point for coal. It contains a court house, high school, and electric railroad, numerous churches, a National bank, and daily and weekly newspapers. It has door and sash mills, coffin and casket factory, hosiery mill, several large railroad shops, nail works, and silk, saw, and rolling mills, and an assessed property valuation of about $1,500,000. Pop. (1890) 5,930; (1900) 9,810; (1910) 13,770.

Sun Cracks, superficial markings frequently seen on the surfaces of thin bedded flagstones and argillaceous sandstones. They are believed to have been formed in the same way as the fissures which are produced on the mud flats of tidal rivers or estuaries by the drying and shrinking of the deposits during their temporary exposure at low tide. The cracks are of course filled up by new deposits when the mud flats are again overflowed. Not infrequently the material filling the sun cracks is of harder consistency than the rock in which they occur. When the bed overlying the cracks is removed a cast of these often projects from its under surface, or frequently the casts remain in the moulds so as to form a series of polygonal ridges ramifying over the whole surface of the exposed stratum.

Sunda, Strait of, between the islands of Sumatra and Java, and connecting the China Sea and the Indian Ocean. It is 100 miles long by about 20 miles wide at the narrowest part.

Sunda Islands, a chain of islands belonging to Malaysia, running E., commencing with Sumatra and ending with Timor, and separating the Java Sea from the Indian Ocean. They belong to the Dutch East Indies.

Sunday, Low. See LOW SUNDAY.

Sunday=School, according to Schaff, "an assembly of persons on the Lord's day for the study of the Bible, moral and religious instruction, and the worship of the true God. It is a method of training the young and ignorant in the duties we owe to God and to our neighbor." Sunday-schools may be said to have passed through three distinct phases:

(1) Early Christian catechetical schools, for the preparation of converts for church-membership, and the instruction of the young and ignorant in the knowledge of God and of salvation. The scholars committed passages of Scripture to memory, and their books comprised parts of the Bible in verse, Jewish antiquities, sacred poems, and dialogues. Schaff remarks that "it might be an interesting problem for a modern scholar to define important features of the present system not to be found in the early Bible schools."

(2) Schools of the Reformation Period: Luther founded schools for catechetical instruction in 1529, and this custom spread wherever the Reformation gained a foothold. In the Roman Church St. Charles Borromeo, Archbishop of Milan, about 1560 introduced into his diocese a system of schools which continues to the present day; and in 1699 the Venerable de la Salle opened a Sunday-school (*êcole dominicale*) at St. Sulpice. Sunday-schools were opened in Scotland about 1560 by Knox; at Bath, in 1650 by Joseph Alleine; in Roxbury, Mass., in 1674, and at many other places in Great Britain and America between that date and 1778.

(3) Modern Sunday-schools: These date from 1780 or 1781, when Robert Raikes, of Gloucester, England, began to collect a few children from the streets of that city on Sundays, and paid teachers to instruct them in religious knowledge. The improvement in the conduct and morals of the children was so marked that, when Raikes published an account of his success, his example was followed in several other places, and in 1785 a society was formed for the establishment and maintenance of Sunday-schools in all parts of the kingdom, a large sum being expended in the payment of teachers. In 1803 the Sunday-School Union was formed to secure continuous instruction by unpaid teachers, and to publish books and tracts for the benefit of the cause. The first Sunday-schools united secular with religious instruction, as did those of Borromeo and La Salle; but the spread of elementary education has to a large extent removed the necessity of teaching reading and writing

on Sundays. The Society of Friends has, however, retained the practice in its large Sunday-morning schools, with great benefit as regards influence over the working classes above the age of childhood, and in some of the Wesleyan Sunday-schools, classes for elementary instruction are held early in the morning. Sunday-schools were introduced into Scotland, Ireland, and America in the years immediately following their establishment in England; the Scotch Society for Promoting Religious Instruction among the Poor was formed in 1796, and the Irish Sunday-School Society was founded in 1809, though a system of Sunday teaching had prevailed in Ireland for some years previously. In later times Sunday-schools have rapidly increased in connection with all Protestant Churches throughout the world.

Sundeep, an island at the mouth of the Meghna, the principal mouth of the Brahmaputra, included within the district of Noakolly, Bengal, British India; area, 420 square miles. It is of recent alluvial formation and liable to be swept by floods. By the disastrous cyclone of Oct. 31, 1876, one-half the population is estimated to have perished either of drowning or subsequent cholera. The crops are rice and betelnuts. In the 17th century it was notorious as the home of Portuguese pirates, who devastated all the river coasts of Bengal; and up to a late period lawlessness has prevailed, owing to the difficulties of communication with the mainland.

Sunderbunds, or **Sundarbans,** a vast tract of forest and swamp forming the most S. portion of the Gangetic delta, at the head of the Bay of Bengal; extreme length along the coast, about 165 miles; greatest breadth, 81 miles; and area, 7,532 square miles. The country is one vast alluvial plain where the continual process of land-making has not yet ceased. It abounds in morasses and swamps, now gradually filling up, and is interseeted by large rivers and estuaries running from N. to S. There is a reclaimed tract along the N. border devoted to the cultivation of rice. The unreclaimed portion near the sea consists of impenetrable jungle and thick underwood traversed by gloomy-looking water courses. The Sunderbunds abound in wild animals, including numerous tigers, leopards, rhinoceros, buffaloes, deer, monkeys, etc. Fish are plentiful, and the python, cobra, and other snakes, together with every description of birds and water fowls are found.

Sunderland, a seaport and municipal and parliamentary borough of England, at the mouth of the Wear, county of Durham, 13 miles N. E. of Durham, and 12 miles S. E. of Newcastle. It is the largest town of Durham, and includes nearly the whole of three parishes — Sunderland, Bishopwearmouth, and Monkwearmouth. The town is for the most part new and well built. It has parks, a museum, a free library, a school of art, etc. The principal buildings include St. Peter's, an ancient parish church on the site of the monastery in which the Venerable Bede was educated, many other churches and chapels, two theaters, etc. The river is crossed by the famous cast-iron bridge of one arch (236 feet span), built in 1793 and since reconstructed and strengthened. The harbor with its docks covers 78 acres, and its entrance is formed by two stone piers with lighthouses. The staple trade interests of the place are shipping, the coal trade, and ship building, and there are also large factories for the making of marine engines, iron work, bottles, glass, earthenware, rope, etc. Coal is the chief export; the imports are chiefly timber and grain, with various raw materials and provisions, from the Baltic ports and Holland. Pop. (1901) 146,828.

Sunderland, Jabez Thomas, an American clergyman; born in Yorkshire, England, Feb. 11, 1842; was graduated at the University of Chicago in 1867 and at the Union Baptist Theological Seminary in 1870; was ordained in the Unitarian Church; and held pastorates in Milwaukee, Wis., Chicago, Ann Arbor, Mich., London, England, Toronto, Can., and other cities. In 1866–1895 he was editor of the "Unitarian Monthly." His publications include "A Rational Faith" (1878); "What is the Bible" (1878); "The Liberal Ministry (1889); "A Tour Through Palestine" (1890); "Home Travel in Bible Lands" (1894); "The Origin and Growth of the Bible" (1894); "Liberal Religion in India" (1896), etc.

Sunderland, Le Roy, an American author born in Exeter, R. I., May 18, 1802; was ordained a Methodist preacher in 1823, and soon became an orator of marked eloquence, especially in the temperance and anti-slavery movements. In October, 1834, he was chairman of the meeting in New York city at which the first Methodist anti-slavery society was formed, and afterward was a prominent delegate to several anti-slavery conventions. Later he turned against Christianity and opposed it for many years. His publications include "Biblical Institutes" (1834); "Appeal on the subject of Slavery" (1834); "Testimony of God Against Slavery" (1834); "Anti-Slavery Manual" (1837); "Mormonism Exposed" (1842); "Pathetism with Practical Institutions" (1843); "Pathetism: Man considered in Respect to his Soul, Mind, Spirit" (1847); "Pathetism: Statement of its Philosophy, and its Discovery Defended" (1850); "Book of Psychology" (1852); "The Trance, and how

Introduced" (1860); etc He died in Quincy, Mass., May 15, 1885.

Sundew, the genus *Drosera,* of which about 100 species are known; often applied specifically to *D. rotundifolia,* the common sundew, a very remarkable insectivorous plant. Darwin's experiments seem to show that the insects captured and absorbed by the species supply them with the nitrogenous matter that the soil in which they grow is too poor to furnish. He thus summarizes the manner in which these plants are nourished:

"A plant of Drosera, with the edges of its leaves curled inward, so as to form a temporary stomach, with the glands of the closely inflected tentacles pouring forth their acid secretion, which dissolves animal matter afterward to be absorbed, may be said to feed like an animal. But, differently from an animal, it drinks by means of its roots; and it must drink largely, so as to retain many drops of viscid fluid round the glands, sometimes as many as 260, exposed during the whole day to a glaring sun. The tentacles on one side are inflected over a bit of meat placed on the disk, the glands are each surrounded by large drops of extremely viscid secretion, which, glittering in the sun, have given rise to the plant's poetical name of sun-dew."

Sundial. See DIAL.

Sun Dog, in meteorology, a luminous spot sometimes visible a few degrees from the sun. It is believed to be formed by the intersection of two or more halos.

Sunfish, the *Lampris luna,* called also opah, and kingfish. Also any individual of the genera *Centrarchus, Bryttus,* and *Pomotis,* from the fresh waters of this country. They are small fishes, about six inches long, and are not used for food. Also any individual of the genus *Orthagoriscus.* The common or broad sunfish (*O. mola*), though a native of warmer seas, is often taken in the summer months round the coasts of Northern Europe, and is usually captured when floating on the surface, as if basking in the sun. When laid hold of they are said to utter sounds like the grunting of a hog. The stomach has been known to contain corallines, barnacles, and seaweed, though usually nothing but mucus is found in it. Couch mentions that the flesh is good eating, but it is never sent to market. The largest specimen on record measured about eight feet long, and rather more in depth from the dorsal to the ventral fins. The oblong sunfish, called also oblong tetradon and truncated sunfish, has the height of body less than one-half its total length. A specimen taken at Plymouth, England, in 1734, weighed 500 pounds, but it is not often met with of so large a size. It feeds on worms, crabs, and other marine animals, and does not float on the surface like the common sunfish.

Sunflower (*Helianthus*), a genus of coarse, tall, herbaceous plants, with large rough leaves and yellow flowers, belonging to *Compositæ,* and natives of America. *H. annuus,* an introduction from Peru, which has long been grown as a showy and large-flowered annual in gardens, has recently been found to possess high economic value. In Germany, Russia, India, and other countries it is now grown on a large scale. The seed-like nutlets in a natural state are excellent food for poultry and pigs; roasted they are said to be a good substitute for coffee; crushed and pressed, they yield a limpid bland oil second in value only to olive oil, either for household purposes or as a lubricator for the delicate machinery of textile fabrics, while the residuum can be used as an oil cake to fatten cattle; the stalks furnish a good fiber; the blossoms yield a brilliant lasting yellow dye, and the leaves serve as manure. The tubers of the sunflower artichoke (*H. tuberosum*) are saccharine, and serve culinary purposes. As fodder they increase the milk of cows to an extraordinary degree. The foliage is also a good fodder. The name sunflower is taken from the large flower "resembling the radiant beams of the sun."

Sungaria. See JUNGARIA.

Sungei Ujong. a native State of the Malay Peninsula under British protection; on the W. side, between the British colony of Malacca and the native State of Selangor; area, 660 square miles; pop. (1891) 23,602, mostly Chinese. The productions are the same as those of the neighboring Straits Settlements.

Sun Gem, in ornithology, a popular name for any individual of the genus *Heliactin.* They are among the most elegant of the humming birds, and have a brilliant metallic double crest and long graduated tail. There is but one species, *H. cornula,* from Brazil.

Sunn (*Crotalaria juncea*), a large leguminous annual, rising under favorable circumstances to a height of 10 feet, in appearance resembling somewhat the allied Spanish broom. It is indigenous to Southern Asia, and also widely distributed through tropical Australia. In the former country sunn has been cultivated from remote times for its fiber, which is manufactured into rope, sackcloth, nets, twine, and paper. It is sown very thickly at the beginning of the rains, so that it may grow tall and slender. When flowering begins the plants are cut near the root, tied in large bundles, immersed in water from four to eight days, beaten on a piece of wood or stone, washed till quite clean, dried, and the broken woody portion separated from the fiber, which is then ready for use. Sunn is also grown as a fodder plant for cattle. The sub-species, *C. tenuifolia,* furnishes Jubbulpore hemp; *C. retusa* yields a

fiber for ropes and canvas, and *C. Burhia* for ropes.

Sunna, Sonna, or **Soonnut,** the oral precepts of Mohammed, not contained in the law, but now collected into a volume. It occupies the same place in Mohammedan, that the Mishna does in Jewish theology.

Sunnites, the name commonly given to orthodox Muslims, because in their rule of faith and manners the Sunna, or traditionary teaching of the Prophet, is added to the Koran. According to Islam the human mind is incapable of attaining light in law or religion but through the Prophet, and all expressions of God's will are equally important. Reason and conscience are here of no value; memory is all. Hell fire is the award due alike to him that prays without being properly washed and to him that denies the word of the Prophet. Accordingly during the Prophet's life his counsel was eagerly and continually sought; and after his death his example and sayings were collected as of infinite value. After the death of the four rightly guided caliphs, Abu Bekr, Omar, Othman, and Ali, intimate friends of the Prophet, fearful uncertainty arose and gradually occasioned the four schools of the four orthodox imâms. The first of these was Abu Hanîfa, born in Basra of a noble Persian family. He taught in Kufa on the Euphrates. He logically deduced from the Koran all religion and law; for the Koran says (Sura 16: 91) "to thee we have sent down the book which clears up everything." Consequently, when the Koran says (S. 2: 20) "for you have I created the whole earth," it follows that to Muslims belongs all the property of unbelievers. Hence the propriety of piracy and aggressive war against them. In his school arose the famous legists of Irâk, and his system, the most widely spread of the four, is now professed by the Turkish empire. He would never hold any office under government, fearing the doom due according to prophetic tradition to every giver of a wrong decision, namely, to be plunged into hell from a height of 40 days' journey. He died in 767 in prison, where the caliph had confined him for refusing to be cadi over the new capital Bagdad.

In 795 died Mâlik ibn Anas in his 84th year in Medina, where he was born and had lived all his days. There, surrounded by traditions of the Prophet, he had taught after the custom of Medina. This had been impossible to Abu Hanîfa, residing amid a partly foreign people and a very complex civilization. Mâlik gathered from the Koran and from local traditions of Mohammed his "Muwâttaa," or "Beaten Path," a complete body of law and religion. He never announced any such tradition without a previous ablution. On his death bed he regretted with tears that he had ever used his own judgment in pronouncing an opinion on a point of law, and wished that he had been flogged and reflogged every time. His system was established in North Africa by African students, who found Medina the most convenient school, and in Spain by his Berber pupil Yahya 'bn Yahya. The third orthodox imâm was Ash-Shâfiî of the Koraish tribe, and descended from the Prophet's grandfather, Abdul-Mûttalib. He was born, it is said, on the day of Abu Hanîfa's death. He taught in Cairo, and there he died in 820. He was an eclectic, but leaned more to the traditionary precedents of his teacher Mâlik than to the deductive method of Abu Hanîfa. His system prevailed in Egypt, and was not uncommon E. It still flourishes in the Asiatic islands.

The use of reason and Greek philosophy had by this time wrought such laxity in faith and in public and private conduct that rigid puritanism was a natural concomitant. Its exponent was Ibn Hanbal, the fourth orthodox imâm, who died in 855 in his native city Bagdad, beyond which his system never had much power. He was a pupil of Ash-Shâfiî, whose lectures, however, he would never allow his own pupils to attend. Tradition and Sunna had now immensely increased, and by these alone the Hanbalites were guided. They are now almost extinct, but were strenuous in their early days, when they would break into festive meetings in Bagdad, beat the singers, break the musical instruments, and pour the wine into the streets. The bulk of tradition had now made editing indispensable, and those huge masses of it began to appear under which the Muslim mind has been crushed to death. As Ibn Hanbal said, "the punishment of the learned man in this world is blindness of heart." Abu Hanîfa had used only 18 traditions, Mâlik 300. Ibn Hanbal used 30,000. These were mainly collected by his friends and pupils. One of these, the excellent Abu Daûd Suleimân, traveling in many Muslim lands, collected 500,000, which he sifted down to 4,800. Another, Yahya 'bn Main, spent a large fortune and wore out his last pair of shoes in collecting 600,000. Helpers copied as many more for him. "I copied quantities of traditions to the dictation of liars," he said, "and heated my oven with them, whereby my bread was well baked." But of the six accepted collections the standard one was made by Al Bukhârî, a friend and pupil of Ibn Main. He taught in Bagdad, and like the best Muslim theologians was a Persian. He died in 870. Of the 600,000 traditions heard by him he admitted only 7,275, whereof the half are probably genuine. Till he had washed and performed two rekas of prayer he never inserted any tradition. An edition by Krehl appeared at Leyden in 1862–1872, in three volumes.

The collection by his Muslim pupil is better arranged, and is more used. The sources of tradition were Ayesha, the first four caliphs, and the six companions of the Prophet, of whom Abu Horaira, a manifest liar, was more prolific than any other. Through one of these channels to Mohammed the *isnâd* or pedigree of every tradition had to be traceable. Worth or internal evidence counted for nothing. The work of collecting was begun too late. The real origin of most traditions was the requirements of interested parties, conscious mendacity, or gossip, specially in the standing camps of Arabs required in every conquered land. The matter is called Hadîth, events, tradition, and is much more entertaining than the Koran. Besides the legal and religious utterances of Mohammed, which are generally in one or two sentences, it embodies endless nonsense about his life and miracles, though Mohammed disowned all miracles but his own inspiration, about spirits, the beginning of the world and its end. Whatever in the Hadith can be imitated or obeyed is Sunna, method; compulsory for guidance if connected with religion, but redundant or collateral, though praiseworthy, if giving mere details of such things as the Prophet's mode of standing or sitting. Its object is to make needless all appeals to reason and conscience. In legislation it is much less used than formerly; but, like the Koran, it is infallible and unalterable, and its only independent expounders are the four orthodox imâms. Legislation merely means a declaration by the Sheikh-ul-Islâm and his council of ulemâ or doctors that this or that agrees with the Koran or tradition. Reformation of law or religion from within is impossible.

Sunset Glow, an abnormally brilliant coloring of the sky at sunset, followed by an after-glow, or reillumination, observed at many places about and after the period of the Krakatoa eruption (Aug. 26, 1883), though the hypothesis that the sunset glows were caused by the eruption is a matter of controversy. Professor Kiessling, of Hamburg, maintains that "An intense purple glow, visible over a considerable area, may occur when, in close proximity beneath a lofty and highly attenuated haze, there is formed an extensive stratum of air of considerable higher temperature."

Sun Spurge, in botany, the *Euphorbia helioscopia*. It has an umbel of five principal branches, five-cleft and three-cleft, and is abundant on waste and cultivated ground, flowering from July to October. The acrid milky juice is used to destroy warts.

Sunstroke (otherwise called Heat-stroke, Heat Apoplexy, Heat Asphyxia, Coup de Soliel), a very fatal affection of the nervous system, which is very common in India and tropical countries, and also in more favored regions in extremely hot weather. The symptoms of the disease are liable to be greatly modified in different cases. Two contrasted forms are recognized. In the cardiac the heart is chiefly affected, and the symptoms are weakess, faintness, dimness of sight, giddiness, etc. Death may take place either suddenly or more gradually from failure of the circulation. If recovery occur it is complete. This form is said to occur only from direct exposure to the sun's rays. In the cerebro-spinal form, the commoner of the two, the symptoms usually come on more gradually; nausea and giddiness may be present at first; but the most striking feature of the disease is either wild delirium or coma, with a pungently hot skin and extremely high temperature — 106° F. or upward. Even those who recover from this form of the disease are apt to suffer for a long period, or it may be permanently, from severe headache, epilepsy, enfeebled mental power, or other nervous disorders. Intermediate varieties are also met with, forming links between these two extremes. The mortality from sunstroke is about 50 per cent. of those affected. In the cases that terminate favorably a gradual remission of the symptoms takes place; and when the skin becomes cool and moist, and sleep has been procured (phenomena which usually occur within 36 hours of the attack), the patient may be regarded as out of danger.

The predisposing causes of sunstroke are (1) an unusually elevated degree of temperature; (2) heavy or unduly tight clothing, particularly if it interfere with the free expansion of the chest; (3) a contaminated atmosphere from overcrowding; (4) all debilitating causes, such as prolonged marches, previous disease, intemperate habits, etc. Death sometimes occurs so suddenly that there is little opportunity for treatment, but the general indications in these cases are the cold douche, from a height of three or four feet, keeping the surface wet and exposed to a current of air, the exclusion of light as far as possible, and the free employment of stimulants. In less rapidly fatal cases the outer clothing should be removed, and the douche applied, as before, over the head and along the spine. Relaxation of the pupil is the first favorable sign. If the pulse flags the douche must be replaced by the mere application of cold to the head, and it may be necessary to apply hot bottles, etc., to the extremities. The hair must be cut short, and the nape of the neck blistered as speedily as possible. If insensibility recurs after an interval of 10 or 12 hours, a blister should be applied to the crown of the head. The extremities and chest should be stimulated with mustard poultices. Immediately after the employment of the douche a strong purgative in-

jection should be thrown into the lower bowel. Under no circumstances should there be any abstraction of blood. If injurious effects persist long after partial recovery, the patient should be removed to a cooler climate. The preventive measures are of more importance than the treatment. There has occasionally been an extraordinary mortality from sunstroke in the United States in very hot summers.

Sun Worship, a form of nature worship, widely, though by no means universally diffused at the present day among races of low culture. The sun would naturally be chosen as a god by agricultural and pastoral peoples, while to races living by the chase the summer heat would not be so advantageous. D'Orbigny suggests that the sun has been worshiped only by races living in temperate climates, where its heat is cheering and vivifying, and that this cultus is practically unknown within the tropics, where the solar heat is oppressive. If not entirely true, this theory contains considerable truth. Herodotus describes the Atlantes, who dwelt in the interior of Africa, as cursing the sun for afflicting them with his burning heat, and Sir Samuel Baker says that in Central Africa "the sun is regarded as the common enemy." Traces of sun worship appear in the earliest records of the human race. They are present in the old theology of Egypt: "Ra, who traverses the upper and lower regions of the universe in his boat, is the Sun himself in plain cosmic personality." Putting aside the later sun gods of Greece and Rome, horses were sacrificed on Mount Taygetus to that Helios to whom Socrates did not think it wrong to pray; and Cicero exclaims at the number of suns set forth by Roman theologians. The worship of Mithra spread from the East into the Roman empire, and that Vedic divinity was at last identified with the sun. In the Old Testament there are solemn denunciations of sun worship (Deut. iv: 19, xvii: 3; Jer. xliii: 13; Ezek. viii: 16–18); for the Israelites were surrounded by sun worshipers, and it is clear from II Kings xxiii: 5, 19, that the rulers of Judah had adopted the cult. Modern Hinduism is full of sun worship, and it exists as a distinct cultus among the Kol tribes, the Khonds, and the Tartars. It is still widely spread among the native races of Central America, and probably found its highest form of development in Peru, where the sun was held to be at once the ancestor and founder of the dynasty of the Incas, who reigned as his representative, and made sun worship the great State religion.

Super, Charles William, an American educator; born in Pottsville, Pa., Sept. 12, 1842; was graduated at Dickinson College in 1866 and studied in Tübingen, Germany, in 1869–1871. He was Professor of Languages at the Cincinnati Wesleyan College in

1872-1878; subsequently became Professor of Greek at the Ohio University and its president (1884-1901). His publications include "Well's Order of Words in the Ancient Language compared with that of Modern Languages" (1887); "A History of the German Language" (1893); and "Between Heathenism and Christianity" (1899).

Super, Ovando Byron, an American educator; born near Newport, Pa., March 2, 1848; was graduated at Dickinson College in 1873; was Professor of Languages at the University of Denver in 1880–1884; and held the chair of modern languages at Dickinson College in 1894–1900. In the latter year he was made Professor of Romance Languages. His publications include "French Reader" (1888); "German Reader" (1896); "History of France" (1900); and essays including "The Cradle of the Aryans" (1887); "The Teaching of Modern Languages" (1893); "Indian Education at Carlisle" (1895); etc.

Superb, The, a name given in the Middle Ages to Genoa; also an epithet of affection applied by his men to the late Gen. Winfield Scott Hancock, as "Hancock, the Superb."

Superbus. See TARQUINIUS, LUCIUS.

Supercargo, a person charged with the accounts and disposal of the cargo, and with other commercial affairs in the merchant ship in which he sails as agent for the owner of the cargo.

Supererogation, the performance of more than duty requires. The doctrine, of supererogation, in Church history, is the doctrine founded on that of the communion of saints, that the merit of good works done by one Christian belong to the whole body of the faithful. The principle was affirmed in the "Institution of a Christian Man" published by authority of Convocation (A. D. 1537):

> "I believe that whatsoever spiritual gift or treasure is given by God unto any one part or member of this mystical body of Christ, although the same be given particularly unto this member, and not unto another, yet the fruit and merit thereof shall, by reason of that incomprehensible union and bond of charity which is between them, redound necessarily unto the profit, edifying, and increase in Christ's Body of all other members particularly."

The Council of Trent decreed nothing on the subject, but the language of the "Tridentine Catechism" is in accord with that quoted above. At the time of the Reformation the sale of indulgences had brought discredit on the doctrine of supererogation, or "as it might more properly be called, the communion of saints in good works," and Article XIV. was directed against the popular belief.

Works of supererogation, is a controversial phrase borrowed from Article XIV. of the Church of England, and there defined as "voluntary works, besides, over, and above God's Commandments." In this sense the expression is used chiefly of the Counsels of perfection — Poverty, Chastity, and Obedience — which, according to Roman theologians, though not universally necessary to salvation, are yet necessary, and become absolute precepts, in the case of those called to such states of life.

Superfetation, or **Superfœtation,** the conception of a second embryo during the gestation of the first; the products of the two conceptions being born together or at different times. Early authorities were strongly convinced that superfetation was not only possible, but common, and though in the present day opinion is divided on the subject, many cases are quoted of which it is claimed that no other explanation than superfetation is possible. Woodman & Tidy ("Forensic Medicine," p. 819) suggest that many of these may be accounted for by the fact that the uterus is sometimes found to be double, and in others they doubt the accuracy of the record observations; adding:

"There is a residuum of unexplained cases, and without pronouncing formally in favor of the doctrine of superfœtation, we must admit that it is difficult to explain some of the recorded facts on any other supposition than that a second impregnation took place, while the uterus or womb contained one ovum or fœtus partially developed."

Superfluous Polygamy, in botany, the term applied when in a composite flower the florets of the disk are hermaphrodite and bear seeds, and the flowers of the ray, which are only female, do so likewise, so that the latter appear superfluous. Linnæus ranked the plants thus constituted under *Polygamia superflua,* which he made an order of the class *Syngenesia.*

Superficies, in geometry, the surface; the area of a surface. It may be rectilinear, curvilinear, plane, convex, or concave. It consists of length and breadth without thickness, and therefore forms no part of the substances or solid contents of a body. The difference between this term and the term surface, is simply this: The term surface is abstract, and simply implies that magnitude which has length and breadth without thickness, while the term superficies does not refer to the nature of the magnitude, but simply refers to the number of units of surface which the given surface contains. In law, everything on the surface of a piece of ground or of a building which is closely connected with it by art or nature, so as to constitute a part of the same, as houses, trees, and the like; particularly everything connected with another's ground, and especially a real right that is granted to a person.

Superior, a city, port of entry, and county-seat of Douglas co., Wis.; on Lake Superior, and on the Northern Pacific, the Chicago, St. Paul, Minneapolis, and Omaha, the Duluth and Winnepeg, the Duluth, South Shore, and Atlantic railroads; opposite Duluth, Minn. It shares with Duluth the commercial advantage of being the extreme W. port of the Great Lake system of the United States. It has three connecting harbors, well sheltered, and deep, making a combined length of 13 miles, with an extreme width of 3 miles. The city comprises the ports known as East, West, South, and Old Superior. Here are the Finnish University, a business college, two high schools, street railroads, electric lights, a State Normal school, St. Mary, St. Francis, and the Women's Christian Temperance Union Hospitals, numerous churches, waterworks, National and State banks, and several newspapers. The industries include the manufacture of flour, lumber, lath, shingles, wagons, chairs, barrels, woolen goods, bags, iron, steel, etc. There are also shipyards, sawmills, coal docks, capable of receiving 6,000,000 tons, many grain elevators, and the largest dry dock on the Great Lakes. The assessed property valuation is nearly $12,000,000. Pop. (1890) 11,983; (1900) 31,091; (1910) 40,384.

Superior, Lake, the extreme W. and most extensive of the great lakes of the St. Lawrence basin, in North America, being the largest existing body of fresh water. It is of a triangular form, extending between lat. 40° 30′ and 49° N., and lon. 80° and 92° 20′ W. Its length, E. to W. is about 360 miles, with a mean breadth of about 80 miles, so that its area may be taken at about 28,600 square miles. The mean depth is estimated at 900 feet, and the height of its surface at about 640 feet above the Atlantic. It receives upward of 50 rivers, but none is of much importance except the St. Louis which enters at its S. W. extremity, and the Riviere au Grand Portage. During the melting of the snow, these and the other rivers sweep into the lake vast quantities of sand, bowlder stones, and drift timber. It discharges itself at its E. extremity into Lakes Huron and Michigan, by the river and falls of St. Mary. This lake embosoms many large and well-wooded islands, the chief of which is Isle Royal. The country of the N. and E. is a mountainous embankment of rock, from 200 to 1,500 feet in height; the climate unfavorable, and the vegetation slow and scanty. On the S. the land is also high, generally sandy, sterile, and the coast dangerous, subject to storms, and sudden transitions of temper-

ature, and to fogs and mists. The mean heat in June and July is about 65° F., but an extremely cold winter prevails.

The boundary line between Canada and the United States passes from Lake Huron up the river St. Mary, the outlet of Lake Superior, through the center of the lower half of this lake, to the mouth of Pigeon river on the N. shore, between Isle Royal and the Canadian coast. The S. coast of the lake from the outlet to Montreal river belongs to the upper peninsula of Michigan. From this river to the St. Louis river at Fond du Lac the coast belongs to Wisconsin, and thence around to Pigeon river to Minnesota. Toward each extremity the lake contracts in width, and at the lower end terminates in a bay which falls into the outlet, the St. Mary's river, at the two opposite headlands of Gros Cape on the N. and Point Iroquois on the S. Thence to the mouth of the St. Mary's at Lake Huron is about 60 miles. The navigation of this river is interrupted 20 miles below its source at the Falls of St. Mary, or, as the place is commonly called, Sault Ste. Marie. Here the river descends in a succession of rapids extending ¾ of a mile, from 18 to 21 feet, the fall varying with the stage of the water in Lake Superior. Birch canoes run these rapids safely, though they appear full of rocks; they have also been run by one sailing vessel, and a sail boat has ascended them before a strong wind.

A ship canal has been constructed past the falls by the United States government, so that now the lake is accessible to vessels from the Atlantic Ocean. It is only through the outlet that Lake Superior has been reached by any ordinary mode of travel, and while the territory belonged to the Indians, the fur companies had exclusive control of this means of access; but communication has been opened by roads from Fond du Lac to the Mississippi, and from the forks of the Ontonagon, on the S. side of the lake into the settled portions of Wisconsin. The latter road pursues a S. course to Lac Vieux Desert, and then branches, one route turning E. toward Green Bay, and the other following the course of the streams that lead into the Wisconsin river. The rocks around the lake are very ancient, belonging principally to the Laurentian and Huronian systems of the Azoic series, overlaid in some places, especially on the S. side, with patches of the Lower Silurian. The prevalent Laurentian rock is orthoclase gneiss. Among the Huronian rocks are greenstones, slates, conglomerates, quartzites, and limestones. The Lower Silurian rocks are soft sandstones. There is everywhere much evidence of glacial action. The Huronian rocks are well stored with useful minerals. The copper and iron mines of the S. side are celebrated for their extent and richness. The richest copper mines are situated near Kee-wee-naw Point. The metal occurs principally native, and sometimes in single masses of great size. Native silver is found associated with the native copper, and sometimes intimately mixed with it. Gold has been found in small specks at Namainse on the British side. Lead ore occurs in some places. The beds of hæmatite, or red iron ore, at Marquette, on the American side, are of wonderful extent. They are situated about 12 miles inland. The ore is conveyed by a railway to the harbor, thence by vessels to Cleveland on Lake Erie, and thence by rail to Pittsburg where it is smelted. The water of Lake Superior, remarkable for its coldness, purity, and transparency, is inhabited by many kinds of fish, among which are the delicious white fish and the gray trout.

Superphosphate of Lime, $P_2O_2(HO)_4 CaO_2$; a compound of phosphoric acid and lime in which only one-third of its acid equivalents is saturated with lime. Technically, it is used to describe an important kind of manure, made by treating ground bones with from one-third to two-thirds of their equivalent of sulphuric acid, whereby acid phosphate of lime is formed, together with a quantity of sulphate of lime corresponding to the sulphuric acid used. By substituting coprolites for bones, a manure of nearly identical composition is obtained. This kind of manure is of the highest value, from its stimulating effects.

Superposition, in common language, the act of superposing; a placing above or over, a lying or being situated above or upon something. Technically: (1) In geology, the position of one aqueous deposit above another. If the strata are horizontal, and have been undisturbed, the lowest is the oldest and the uppermost the newest; if, in any district, they are curved, fractured, or vertical, the test of superposition in that district may be fallacious, and to insure certainty the strata must be studied in one less disturbed. In the case of volcanic rocks, superposition is in most cases a test of relative age. (2) In geometry, the process by which one magnitude may be conceived to be placed on another, so as exactly to cover it, or so that every part of each shall exactly coincide with every part of the other. Magnitudes which thus coincide must be equal.

Supernaturalism, a term used chiefly in theology, in contradistinction to rationalism. In its widest extent supernaturalism is the doctrine that religion and the knowledge of God require a revelation from God. It considers the Christian religion an extraordinary phenomenon, out of the circle of natural events, and as communicating truths above the comprehension of human reason. Rationalism maintains that the Christian

religion must be judged of, like other phenomena, by the only means which we have to judge with, namely reason. See RATIONALISM.

Superstition, credulity regarding the supernatural, or matters beyond human powers; belief in the direct agency of superior powers in certain events; as a belief in witchcraft, apparitions, magic, omens, charms and the like, a belief that the fortunes of individuals are or can be affected by things deemed lucky or unlucky, or that diseases can be cured by charms, incantations or the like. Superstitions concerning various articles of food, animals, days of the week, and even the most ordinary events of life are common, not only among the ignorant and lower classes of mankind, but among the highly educated and cultured.

The origin and influence of these superstitions is an interesting study. Salt for instance is probably the only article of food which has been used by every nation and in every age since the beginning of civilization. In ancient times it was very scarce and very costly. From this grew the Eastern custom that whoever should eat salt together — the most precious possession — must be friends for life. An Oriental will not kill or harm a man with whom he has eaten salt. The belief that it is unlucky to spill salt at the table originated in the legend that at the "Last supper" Judas Iscariot, who went thence to betray his Lord and Master, upset the salt cellar while reaching out his hand. The Chinese in observing the last festival of the year throw salt on the fire in front of the ancestral tablets. In remote parts of the world cakes or blocks of rock salt have been used as money and we speak of a no-account fellow as not "worth his salt." In some countries salt was held sacred. The Germans believed that soil-made salt by saline springs was peculiarly holy. Allusion to salt is frequent in the Scriptures. The Mexicans had a goddess of salt.

Many ancient superstitions were connected with the Sabbath, and especially with the punishment meted out to those who desecrated the holy day. At one place in England a carpenter who made a peg and a weaver who remained at his loom after 12 o'clock on Saturday night, were each smitten with palsy. A baker baked a cake in the early hours of Sunday and it bled all day. A miller who kept his mill going was obliged to stop because of the blood that flowed between the stone, and a man who fell into a pit on the Sabbath was allowed to remain there till the following day. In France there is a saying that "if you meet a funeral while driving you will have an accident before your drive is over, unless you turn back." Many gamblers will not play on a day in which they meet a funeral and others will bet only on the black in rouge et noir.

Among common superstitions are those which regard as unlucky, the seeing of the new moon over the left shoulder; the beginning of a journey or any enterprise on Friday; the passing under a raised ladder; the meeting of a hunchback; the presence of peacock's feathers in a room; the killing of a cat; putting on the left shoe before the right; cutting the nails or hair of a child before it is a year old.

Supplejack, a popular name given to various strong twining and climbing shrubs. The supplejack imported into Europe for walking sticks is the barked branches of one or more West Indian species of *Paullinia*, natural order *Sapindaceæ*. The name is also given to a rhamnaceous twiner (*Berchemia volubilis*), found in the Southern United States.

Supplicants, The, a name assumed in 1637 by the petitioners against the introduction of Laud's Service Book and the Book of Canons into the Scotch Church. The Supplicants signed the Covenant in 1638, and were thenceforward known as Covenanters.

Supply. See DEMAND AND SUPPLY.

Supply, Committee of. In Great Britain all bills granting supplies of money for public service must originate in the House of Commons, and according to the rules of procedure of that House questions of supply must first be considered in a committee of the whole House. This committee is called a committee of supply. In committee members of the House may speak repeatedly on the same question. The means of raising the sums voted in supply are discussed in a committee of ways and means. These two committees sit at intervals during the greater part of the session. In the Congress of the United States the committees of supply are the House Committee on Ways and Means and the Senate and House Committees on Appropriations.

Supporter, in heraldry, a figure on each side of a shield of arms, appearing to support the shield. They may be figures of beasts or birds, real or fabulous, or of men, sometimes naked and sometimes clad in armor. They may have originated in the ceremonial bearing of the knightly shield to tournaments and jousts by squires or retainers of a noble house.

Suppuration, a morbid process which gives rise to the formation of pus, one of the destructive terminations of the inflammatory action. The phenomena of suppuration are thus described: The inflammatory leucocytes, instead of developing into fiber cells and forming tissue, become developed into pus globules, and the exudation breaks

down more or less completely into a creamy fluid called pus, which consists of these globules floating in serum, the liquor puris. Pus globules, as seen out of the body, are but little different in appearance from leucocytes. The leucocyte, when treated with acetic acid, displays the appearance of a nucleus in its interior, that appearance being usually regarded as the result of a shrinking of the protoplasm of which it is composed. The pus globule shows more distinct trace of a membrane, and is frequently many-nucleated when treated with acid, a condition which Rindfleisch regards as indicating a tendency to degenerate and break down. But the same author says that many of the corpuscles of pus display no difference whatever in character from the blood leucocytes, having only single nuclei, showing the same amœboid movements, and being in fact obviously the same things both in structure and function. This should be borne in mind in connection with the fact that suppuration is not, in most cases, wholly a destructive process, but serves also as one of the usual modes of repair. The result of the process of suppuration is thus twofold, being in part destructive and in part constructive. Suppuration in the interior of the body usually terminates in the formation of an abscess; but in some cases the matter is diffused through the interstices of the part, and is termed diffuse inflammation.

Supracoralline, in geology, resting on coralline beds; applied to such portions of the beds above the Middle Oölite as are found naturally resting on it, or are in some way connected with the upper part of the formation. They are not very fossiliferous.

Supracetaceous, in geology, above the Cretaceous beds. The term was introduced by Sir H. De la Beehe, and was largely in use before the importance of those newer strata was understood; now called Tertiary.

Supra-decompound, in botany, having various compound divisions or ramifications. In leaves it is used of those whose petiole bears secondary petioles, as the leaf of *Mimosa purpurea.*

Supralapsarians, Calvinists who held that God for his own glory eternally decreed the fall of man and the consequent introduction of sin into the world, and that the election of some to everlasting life, with the rejection of others, was formed "beyond" or before, and was in no way consequent or dependent upon the foreseen fall of man. Of this school were Beza, Francis Gomarus, and Voetius. Opposed to infralapsarian.

Supranaturalism, a term first employed in Germany toward the close of the 18th century to designate the belief of orthodox Protestants. Now used in a much wider sense, so as to include any doctrine appealing to revelation as its authority.

Supraorbital, in anatomy, being above the orbit of the eye. A supraorbital artery is a branch of the ophthalmic artery terminating upward in the forehead. It distributes branches to the eyelids and communicates with the temporal artery. A supraorbital notch or foramen is a notch or foramen in the orbital arch which transmits the supraorbital nerve and artery.

Suprarenal Capsules, in comparative anatomy two flattened bodies of crescentic or bent triangular form, one surmounting each kidney, attaining a disproportionately large size in the fœtal state in man and the *Quadrumana.* The right capsule is placed lower down than the left. They are an inch and a quarter to an inch and three-quarters high, an inch and a quarter wide, and two to three lines thick. Their weight in an adult is one or two drachms. They are fibrous, composed principally of simple or closed vesicles resembling the secreting glands, except that they have no duct. Their function is unknown. Called also suprarenal glands or bodies. In 1855 Dr. Thomas Addison attempted to prove that a disease, often attended by bronze skin and fatal in from six months to five years, has its seat in the suprarenal capsules.

Supremacy, the quality or state of being supreme, or in the highest station of power; highest or supreme authority or power.

Supremacy, Oath of, an oath required to be taken in Great Britain along with the oath of allegiance, denying the supremacy of the Pope in ecclesiastical or temporal matters in that realm. It has now been greatly modified and simplified.

Supremacy, Papal, the authority, partly spiritual and partly temporal, which the Pope, as Bishop of Rome and successor of St. Peter, claims to exercise over the clergy, and, through them, over the laity, of the whole world. The development of this supremacy dates from the time when Christianity became the State religion of the Roman empire under Constantine. Its influence was great in England under the Norman kings, and reached its highest point in the reign of John (1199–1216), from which period it began to decline, and received its death blow from the Act of Supremacy, in the reign of Henry VIII.

Supremacy, Royal, the supremacy in the Church of England, as by law established, of the temporal power in all causes purely temporal, and in the temporal accidents of spiritual things. By an act of Henry VIII. the king was declared to be the "only supreme Head on earth of the Church of England," though it was expressly declared that he did not "pretend

Supreme Court of the United States

to take any power from the successors of the apostles that was given them by God." In the same year (1535) Fisher, Bishop of Rochester, and Sir Thomas More were beheaded for denying the royal claim. On the accession of Elizabeth the title was kept in the background; but the supremacy of the sovereign in all causes, as well ecclesiastical as civil, was asserted. The royal supremacy was one of the main causes of the civil war in the 17th century; it received a check at the revolution of 1688 which enforced toleration of Nonconformity, but in the latter half of the 19th century more than one clergyman was committed to prison for disobeying the ruling of the law courts in ecclesiastical matters.

Supreme Court of the United States. In accordance with the provisions of the United States Constitution there was organized in 1789 a Supreme Court, John Jay receiving the first appointment as chief justice. With him were joined as associate judges John Rutledge, of South Carolina; James Wilson, of Pennsylvania; William Cushing, of Massachusetts; John Blair, of Virginia; and James Iredell, of North Carolina. John Jay held the office till 1795, and in 1796 Oliver Ellsworth became chief justice. The latter presided over the court till in 1800 the infirmities of age compelled his resignation. Then came the long and honorable incumbency of Chief-Justice John Marshall who held the office from his appointment in 1801 to his death in 1835. This was a very notable period in the history of this court, and Judge Marshall's decisions have always been ranked as of preëminent ability. In 1836 the appointment of Roger B. Taney to the chief justiceship by President Jackson was confirmed by the Senate, and he took his seat on the bench in January, 1827, entering on his long term of 27 years. It was his celebrated decision in the case of the negro, Dred Scott, relative to the status of the slave race in America that applied the torch to that immense heap of combustibles whose explosion was the Civil War. At the death of Chief-Justice Taney in 1864, President Lincoln appointed as his successor Salmon P. Chase, later Secretary of the Treasury, and author of most of the great financial measures and expedients by which the national credit had been preserved during the war. His official term extended to his death in 1873, and covered the period when the important issues arising from the Civil War were under adjudication. To Chief-Justice Chase fell also, by virtue of his office, the duty of presiding at the impeachment trial of President Andrew Johnson. In 1874 the appointment of Morrison R. Waite as chief justice was made by President Grant, and the death of this able jurist in 1888 devolved on President Cleveland and the Senate the duty of selecting his successor, Melville W. Fuller, who now holds the office.

In the formation of the Constitution of the United States it was intended that the three general departments of the government should be of correlative rank and influence. And the decisions of the Supreme Court, especially those rendered since the Civil War, in the construction of the constitutional amendments which were made as a result of that war, have been of such fundamental and far reaching consequences that the value and importance of this tribunal in the United States system of government have been made more strikingly conspicuous than ever before. Its judgments, for example, in regard to civil rights, interstate commerce, prohibition liquor laws, the Mormon question, the right of Congress to authorize the use of paper money in time of peace, the legislation of Congress in regard to the Southern States by so-called "force bills," the relations of the States to the federal government, etc., have been of the highest importance, and their influence in the future will be almost incalculable. The importance of the conservative opinion of this great national court in determining, at least negatively, the final validity of all legislation and of all subordinate judicial decisions, can hardly be overestimated. The same may be said of the Supreme Bench, considered as the only immoveable breakwater against the unscrupulous and rampant spirit of party. It is fortunate, moreover, that the offices of our chief justice and the associate judgeships are appointive, and are thus removed in a great measure from the perfidy of the convention and the passion of a partisan election. The Supreme Court, at its first session in 1790, as already noted consisted of a chief justice and five associates. By successive acts of Congress the number of associate justices was increased to six in 1807, to eight in 1837, and the statute now in force passed in 1869 fixes the number at eight. The retirement of supreme justices at the age of 70 is not compulsory, but a mere personal privilege. This provision was originally enacted April 10, 1869. Sec. 1, Art. III., of the United States Constitution expressly provides that the judges "shall hold their offices during good behavior," so that if they do not voluntarily take advantage of the foregoing provision and are not removed, they are entitled to exercise the duties of their office till death.

The Supreme Court is the judicial court of last resort in the Federal system. The chief justice has a salary (from 1911) of $15,000 and the associate justices of $14,500 each, and their compensation cannot be diminished during their continuance in office. The sessions are held in Washington, D. C., and any six justices constitute a quorum.

Each judge of the court, moreover, must, at least once in every two years, attend a term in one of the nine circuit courts in those parts of the country where those courts are held. The judicial power of the Supreme Court and of the inferior federal courts extends to all cases in law and equity arising under the Constitution, the laws of the United States, and treaties made under their authority; to all cases affecting ambassadors, other public ministers, and consuls; to all cases of admiralty and maritime jurisdiction; to controversies to which the United States is a party, and to controversies between two or more States or between citizens of different States, etc.; but not to suits against one of the States by citizens of another State, or by citizens or subjects of any foreign State. The Supreme Court has original jurisdiction in cases affecting ambassadors, public ministers, and consuls, and when a State is a party; but its chief jurisdiction is appellate. Thus it hears appeals from the circuit courts and from certain district courts having circuit court powers; in civil actions; where the matter in dispute exceeds $5,000, or in equity and maritime cases, $2,000. But there are some cases, as, for example, in regard to patents and copyrights, revenue laws, and civil rights, where an appeal is allowed without regard to the value in dispute. Moreover, if decisions in the highest courts of the various States are in conflict with the Constitution, treaties, or laws of the United States, they may be appealed to the Supreme Court. No appeals from Territorial courts, from the Court of Claims, etc., are heard in this court.

Surabaya, or **Soerabaya,** a large seaport town of Java; on the N. E. coast, and capital of one of the three provinces into which the island is divided by the Dutch; lat. 7° 12′ 30″ S.; lon. 112° 44′ 7″ E.; it is at the mouth of a navigable river, 1½ mile from the seashore. The river separates the European part of the town from the Chinese and the native quarter. The houses are very good, and some are elegant, particularly the country seats of private individuals. Surabaya is situated within that narrow strait which is formed by the islands of Java and Madura, and is defended by batteries. The mouth of the river is also defended. Pop. (1900) 146,944.

Surajah Dowlah, the last independent nawab of Bengal, under whom was perpetrated the massacre of the Black Hole. He succeeded his grandfather, Ali Verdy Khan, in 1756, and within two months of his accession found a pretext for marching on Calcutta. On the arrival of Clive and Admiral Watson he retreated to Moorshedabad, but was routed at the battle of Plassey (June 23, 1757). He then fled up the Ganges, but was betrayed by a *fakir,* and was put to death by order of the son of Meer Jaffier, the new nawab. Surajah Dowlah's reign lasted 15 months, his age at the time of his death being barely 20.

Surat, a town of India, Bombay presidency, capital of a district of the same name, on the left bank of the Tapti, about 20 miles above its mouth in the Gulf of Cambay. The town possesses few attractions, and consists of narrow winding streets lined with lofty houses. It contains several public buildings, including two hospitals, and an old castle or fortress now containing public offices. Surat was first heard of in 1512 as sacked by the Portuguese. The first English factory was established here in 1612, and 40 years later all the other possessions of the company were placed in subordination to it. In 1692 the seat of government was transferred to Bombay. Henceforth Surat became a bone of contention between the Mogul deputy and Mahratta invaders. In 1759 the English seized the castle; and in 1799, on the death of the last real nawab, themselves assumed the administration. In 1842 the titular dignity of Nawab of Surat also became extinct. Surat is still a considerable center of trade and minor manufactures. The organization of trade guilds is here highly developed. The chief exports are agricultural produce and cotton; but the trade and importance of the town are insignificant compared with former times, Surat in the 18th century being perhaps the foremost city in India. Pop. (1901) 118,364.

Surakarta, a trading town on the N. E. coast of Java; near the mouth of the Solo river, opposite the island of Madura; 150 miles W. S. W. of Samarang. It is the chief town of the feudatory State of Surakarta and the residence of the emperor and of many of the native princes and nobles. The emperor's palace is a building of great extent and grandeur. The European town, defended by a strong fort, has a trade in rice, sugar, coffee, pepper, tobacco, etc., and a pop. (1900) of 109,459.

Surety, in law, one who is bound with and for another who is primarily liable, and who is called the principal; one who enters into a bond or recognizance to answer for his payment of a debt, or for the performance of some act, and who, in case of the his payment of a debt, or for the performance of some act, and who, in case of the failure of the principal, is liable to pay the debt and damages; a bondsman, a bail. A surety of good behavior is a recognizance or obligation to the commonwealth entered into by a person with one or more sureties before some competent judge of record, whereby the parties acknowledge themselves to be indebted to the commonwealth in a specified amount, with condition to be

void if the defendant shall demean and behave himself well, either generally or specially, for the time therein limited. It includes surety for the peace and something more. A justice may bind over all nightwalkers, such as keep suspicious company or are reported to be pilferers or robbers, common drunkards, cheats, idle vagabonds, and other persons whose misbehavior may reasonably bring them within the general words of the statute as persons not of good fame. A surety of the peace is the acknowledgment of a bond to the commonwealth, taken by a competent judge of record, for keeping the peace.

"Any justice of the peace may, *ex-officio,* bind all those to keep the peace who in his presence make any affray; or threaten to kill or beat another; or contend together with angry words, or are brought before him by the constable for a breach of the peace in his presence; and all such persons as, having been before bound to the peace, have broken it and forfeited their recognizances. Also, whenever any private man has just cause to fear that another will do him a corporal injury, or procure others so to do; he may demand surety of the peace against such person; and every justice of the peace is bound to grant it, if he who demands it will make oath that he is actually under fear of death or bodily harm. This is called swearing the peace against another; and if the party does not find such sureties as the justice in his discretion shall require, he may immediately be committed till he does, or till the expiration of a year; for persons committed to prison for not entering into recognizances or finding sureties to keep the peace can in no case be detained for more than twelve months. Such recognizance, when given, may be forfeited by any actual violence, or menace even, to the person of him who demanded it, if it be a special recognizance; or, if the recognizance be general, by any unlawful action whatsoever, that either is or tends to a breach of the peace."

Surface, in mathematics, the boundary of a solid, having two dimensions, length and breadth. It may be conceived to be generated by the motion of a straight or curved line, just as a curve is generated by the motion of a point. Of all surfaces, the most important are those of the second order, which are intersected by a straight line in at most two points, and whose curve of section by a plane is a curve of the second order. Hyperboloids, ellipsoids, paraboloids, spheres, cones, and cylinders, and also the limiting case of two planes, are included among the so-called quadric surfaces.

Surface Grub, a name applied to the larva or caterpillar of the great yellow underwing moth (*Tryphœna pronuba*), attaining a length of an inch and a half, and of a pale-green color tinted with brown and spotted with black. The larva is destructive to vegetables. It appears commonly in hayfields in spring and summer. The moth itself is of a pale tawny color on the upper wings, and has the hind wings of an orange hue.

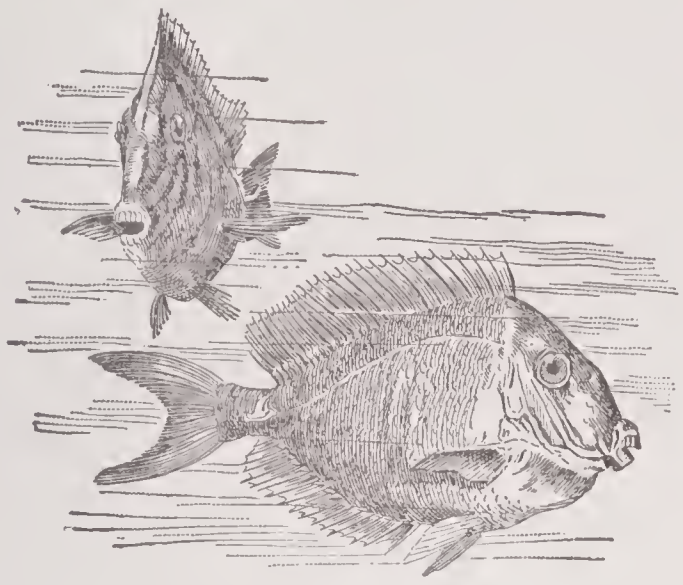
Surface Tension, in liquids, that property in virtue of which a liquid surface behaves as if it were a stretched elastic membrane — say a sheet of india-rubber. The idea is due to Segner (1751); but it was Young who in 1805 first applied it successfully to the explanation of various physical phenomena, such as those of capillarity. The whole subject was subsequently developed in its complete mathematical form by Laplace and Gauss. Pure water has the highest surface tension of any ordinary liquid except mercury. If a little alcohol be dropped on the water, the surface tension will be diminished there. The more powerful surface tension over the pure water will show its superiority by pulling the alcohol over the whole surface till the surface is reduced to uniformity, and equilibrium produced. Again a piece of camphor placed on water will dart from place to place in the most capricious manner. This is due to the irregular way in which the camphor dissolves in the water, so that the surface tension is more weakened on one side than on the other. It is the action of surface tension that draws out all over the surface any impurities that may settle on it; and hence arises the great difficulty of getting a clean water or mercury surface. Drops of liquid, free from all but their own molecular forces, assume spherical forms, this being the only shape consistent with equilibrium under the influence of equal surface tension at all parts of the curved surface. Ripples on the surface of any liquid progress because of the action of surface tension, which gives rise to an inward pressure on any convex surface. In cohesion figures we have some very exquisite phenomena which have been closely studied by Tomlinson. These are produced by dropping a dark-colored liquid into a transparent liquid of slightly smaller density. Ordinary ink dropped into water will serve the purpose very well, though better effects are obtained with a solution of permanganate of potash. As the drop meets the water surface, the action of the surface tension pulls the under surface of the drop outward, and transforms the drop into a vortex ring which slowly sinks through the clear fluid. As it so sinks it breaks up into smaller rings and shoots out fantastic ramifications of rare beauty. Ultimately, of course, under the influence of diffusion, the vortex motion decays and the dark liquid mixes with the clear liquid.

Surf Duck, or **Surf Scoter,** a species of duck (*Oidemia perspicillata*), about the size of a mallard, rarely seen on the British coasts, but frequent on the coasts of Labrador, Hudson Bay, and other parts of North America.

Surgeon, one who practises surgery; in a more limited sense, one who cures diseases or injuries of the body by operating

manually upon the patient. In a more general sense, one whose occupation is to treat diseases or injuries by medical appliances, whether internal or external.

In ichthyology, a popular name for any species of the genus *Acanthurus*, from the sharp, erectile, lancet-shaped spine with



SURGEON FISH.

which each side of the tail is armed. In the early stages of their growth these fish are so different from the fully-developed individuals, that for some time the young fish were placed in a separate genus, *Acronurus*.

Surgeon-general, in the United States army the chief of the medical department. In the British army a surgeon ranking next below the chief of the medical department.

Surgery, manual intervention, mediate and immediate, in all lesions or malformations of the human body. It was already an art when medicine proper was but a phase of superstition. The earliest notices of it occur among the Egyptians, who, as we find represented on obelisk and in temple, practised incisions, scarifications, probably even amputation, long before the date of the Ebers papyrus (3500 B. C.). Castration (to supply eunuchs for the royal harem) was also a frequent operation. Preserved in museums may be seen surgical instruments contemporary with votive offerings of the remotest Egyptian epoch — lancets, tweezers, catheters, uterine specula, iron rods for the actual cautery, etc. Among other indications of early proficiency in ophthalmic surgery, couching cataract must have been known to them.

Jewish surgery, like Jewish medicine, was an importation from the Egyptians. The sexual regulations characteristic of the Jews affected their surgery, from simple circumcision up to the Cæsarean section, which very early in their history was practised on pregnant women in death as in life.

Without entering into the controversy as to the Greek origin of the Indian healing art, we find surgery enjoying high esteem among the Indians in very remote times. "A physician who is no surgeon," so ran their proverb, "is like a bird with but one wing." Surgical instruments skillfully made of steel, to the number of 127, still attest their proficiency in cutting and cauterizing — the latter performed in observance of an aphorism quite Hippocratic in its ring — "What drugs and knives cannot cure may be cured with fire." Their surgeons were trained to operate by practising not on animals or on the dead human subject, but on wax-covered boards, on beasts' skins, or on succulent plants and fruits. Hemorrhage they checked by cold, by compression, and by styptics. The ligature they seem not to have known. Amputation was confined to the hand in cases of intractable hemorrhage. Lips or surfaces of wounds they smeared with an arsenical salve. For intus-susception, volvulus, and such abdominal lesions they practised laparotomy, while fistula in ano (diagnosed by the speculum) they treated with the knife and corrosives. Lithotomy, in no case performed without the sanction of the rajah, they practised on the method (*sectio lateralis*) described by Celsus. The claim asserted for them of having independently of the Greeks devised the operation of rhinoplasty (constructing a nose from the neighboring tissue — in this case from the cheek), and also that for cataract, has still to be made good.

As to the surgery of the other Orientals we possess but obscure notices. Among the Persians we find Greeks in general practice under King Cambyses. The Chinese six centuries B. C. performed surgical operations (castration, for example) in the rudest fashion, and placed much reliance on acupuncture and the moxa. Japanese surgery betrays similar features.

In Greece surgery had attained high development before Hippocrates put medicine on a rational basis, and in the Hippocratic books we find a rich collection of surgical doctrine and practice drawn from centuries of experience. The treatise called "Iatreion" contains a description of the practitioner's room, its lighting, the instruments and appliances necessary, the duties of assistants, the accommodation of the patients, the position of the operator, the use of the hands, of water, of bandages, of sounds manufactured from tin or lead, etc. A full account of wounds and their treatment is given, hemorrhage being arrested by cold, by compression, and styptics, the wounds themselves healed by primary union or through suppuration. Cataplasms cold and warm and plasters are also described in this connection. Lesion of the joints and its manifold consequences, and injuries to the medulla spinalis (paraplegia, etc.) are also dealt with. Dislocations and fractures have

special treatises devoted to them. On the battlefield, on shipboard, in building operations, gymnastic and athletic contests the Greek surgeon lost no opportunity of perfecting the knowledge to which the latter-day world has surprisingly little to add. Medical scholarship has proved that many of the rarest forms of dislocation had not escaped Hippocrates. Even modern appliances were in great part anticipated by him — splints, for example, and bandages of various kinds. The gem of the Hippocratic surgery (according to Häser) is the treatise on injuries of the cranium — fractures, fissures, and contusions with or without depression. For such cases trepanning is the sovereign operation, to be performed as early as possible, less to get rid of effused blood, pus, etc., than, by removal of the injured osseous structure, to prevent inflammation of the scalp. This bold and circumspect practice creates surprise that the greater operations (extirpation of tumors, aneurisms, amputations, etc.) were ignored, till we remember that in their meager knowledge of anatomy Hippocrates and his school were slow to risk section of the more important vessels and nerves. The removal of extremities which had become gangrenous shows again the Hippocratic surgery in a wonderfully favorable light. Hernias, hemorrhoids, fistula are also described and treated with a judgment and skill remarkable for the time.

The post-Hippocratic school (its greatest surgeon being Praxagoras of Cos, noted for his cure of volvulus) has little to detain us; but the Alexandrians left a distinct mark on every branch of the healing art — surgery included. Our best knowledge of them comes from Celsus, who names as the most celebrated surgeon of Alexandria Philoxenus, a voluminous writer on the subject. Ammonius, the lithotomist, is another light of the school, lithotrity being his special contribution to practice.

Roman surgery can hardly claim M. Porcius Cato (234–149 B. C.) as more than a shrewd amateur who left some handy rules for the treatment of fractures, ulcers, nasal polypi, fistulæ, strangury, etc., having doubtless drawn on his experience as a slave-owning patrician. Archagathus (218 B. C.) was a regular practitioner, known, for his skillful handling of dislocations, fractures, and particularly wounds, as the "Vulnerarius." The senate confirmed the popular appreciation by providing him with a "taberna" in a much frequented thoroughfare. But when from such practice he proceeded to operate with the knife his popularity fled, he was nicknamed the "Carnifex," and had to leave the city. Celsus, the patrician dilettante in medicine, is really the highest name in Roman surgery, though it is doubtful whether he ever operated. Of the eight books of his admirably written work the last two treat of surgery, including plastic replacement of defects in the outer ear, the nose, and the lips; lithotomy as practised on boys (a celebrated chapter); amputation, previously described by no other author; diseases of the bones, with the operation of trepanning, fractures simple and compound, and dislocations.

Galen, though a master of surgery, and, before his settling in Rome under M. Aurelius, a practitioner of it, seems to have contributed nothing of his own to its doctrine or practice. As he found it (with some notable additions) it remained to the close of the Byzantine period. An intimate knowledge of its *modus operandi* during these centuries may be inferred from the collection of surgical instruments dug up at Pompeii and now on view at Naples. These are about 300 in number, consisting of some 60 different kinds: needles, hollow probes (straight, curved, and toothed), catheters, specula vaginæ, pincers, cauteries, bistouries, lancets, scissors, etc., mostly of bronze, many of the cutting ones of iron. To sum up: blood-letting was practised in antiquity by venesection, arteriotomy, cupping, and (later) by leeches. Hemorrhage was checked by cold water, styptics, cauterizing, ligature, and torsion — the two latter not mentioned by Hippocrates, the ligature being a device of the Alexandrians, as torsion was of the empire, after which time it fell into desuetude. The treatment of fractures and dislocations was practically the same from Hippocrates to Palus Ægineta (A. D. 650). Trepanning received several modifications in practice up to Galen's time, while tracheotomy (introduced by Asclepiades, 1st century) was by Paulus restricted to cases of choking, when the deeper air passages were free. The evacuation of pus in empyema, frequently mentioned by Hippocrates, was seldom performed in later times — Paulus recommending, instead of the knife, the application of the actual cautery to the wall of the thorax. The operation for hernia, perfunctorily dealt with by Hippocrates, had by the epoch of Celsus assumed the practical development in which it is found during the later empire, Heliodorus, under Trajan, being noted for his radical cure of the scrotal form. Lithotomy, in the Hippocratic period confined to specialists, was by the Alexandrian school raised to full surgical honors, to be supplemented under the Byzantine empire again by lithotrity. In Paulus we find a well-nigh exhaustive list of operations for disease or malformation of the genitals, even including syphilis (Häser), while rectal and anal affections (hemorrhoids, fistula, etc.) were skillfully treated by Leonides (A. D. 200), who seems to have used the écraseur as well as the knife and the cautery. Large

Surgery

tumors in the neighborhood of great vessels were untouched by Hippocrates or Celsus, though the latter makes mention of the surgical cure of goîter. On the other hand, Leonides extirpated the cervical glands; Antyllus (A. D. 300) tied their vessels above and below the point of section; and Paulus removed them by constricting them at their base by a ligature. Cancerous tumors after Celsus' time came within the category of *Noli me tangere*. Ancurisms find no place in Hippocrates, and Celsus refers only to the extirpation of varices. Antyllus seems first to have classified and dealt with the former — in true aneurism isolating the artery with a ligature above and below the sac, which he then opened and emptied. Amputation after Celsus is described by Archigenes, hemorrhage being obviated by ligature of the great vessels or constriction of the limb. Flap-amputations were performed by Heliodorus and Leonides. Resection of the humerus, the femur, and the lower jaw proves (according to Häser) the high development to which surgery under the empire had attained, as also do the plastic operations which Antyllus describes with a fullness and freedom unknown to Celsus. A word may be added here for the medico-military service of that time, afloat and ashore, apparently quite as well organized as the combatant arm. Under the Byzantine Emperor Maurice (582–602) the cavalry had an ambulance company whose business it was to bring the severely wounded out of action, and who were provided with water flasks and cordials to relieve the fainting.

The Arabs borrowed their surgery from the Greeks, chiefly from Paulus Ægineta, even more slavishly than their medicine. Their neglect of anatomy and their Oriental repugnance to operations involving the effusion of blood serve to explain the fact that except Abulcasim (died 1122) they contribute no memorable name to this branch of the healing art.

Salerno did incomparably less for surgery than for medicine, partly because its representatives being mostly ecclesiastics held aloof from manual intervention, partly because its copyist monks reproduced from the classic authorities only the medical writings, leaving out those which had little or no interest for men of the cloister — gynæcology, surgery, pædiatry, etc. Still there is evidence that from the 10th to the first half of the 13th century they did take cognizance — theoretical at least — of wounds, burns, abscesses, fractures, dislocations, cancer, urinary calculi, and external applications.

Surgery continued to be looked down on by physicians, all the more that the recently founded universities gave the latter the prestige of a culture denied to the adventurers who healed wounds, reduced dislocations, and set fractured limbs. Throughout the Middle Ages surgical literature seems to have shared the fortunes of medical literature — first the Greeks were in the ascendant, then their servile imitators the Arabs. The earliest mediæval writers in surgery were Italians, superseded in the 14th century by the French, while the same period witnessed the first English, Dutch, and German books on the subject. Guy de Chauliac, the highest name in that century, labored to bridge the chasm between surgery and other branches of medicine. For all that, the mediæval surgeon in Eastern Europe remained far behind his predecessors of the Roman and Byzantine empires. Traumatic hemorrhage was arrested by the cautery and styptics, though the ligature had not quite fallen into oblivion. Operations for hernia and vesical calculus ranked highest in importance. Plastic surgery was a 15th-century revival of the ancient procedure, carried to rare perfection a century later by Tagliacozzi, again to sink into disuse. Similar fate befell the narcotic drink, resuscitated in the same century, to dull the pain of surgical operations. The active principal of these had been inhaled even in the 13th century, and Guy de Chauliac also used opium internally for the same end.

With the 16th century we find surgery sharing the advance communicated to every art by the Renaissance, while its practitioners improved their social standing. In this the way had been led by Paris with her College of Surgeons (Collége de St. Côme, 1279), which in the teeth of the university "faculty" conquered the right to create licentiates in surgery. Other qualifying corporations (in London, for example, and Edinburgh) arose gradually on similar lines. But what crowned the recognition of surgery as a liberal profession was its steady progress as a beneficent public agent in peace as in war. Skill in treating gunshot wounds, in substituting the ligature for the cautery in amputations, and in dealing with the cutaneous affections due to pestilences like that of syphilis reinforced the claims to respect already established by fuller anatomical, chemical, and botanical knowledge. The powerful if eccentric genius of Paracelsus was signally instrumental in this direction; still more so the sound sagacity and nobly philanthropic inspiration of Ambrose Pare (1517–1590). Galileo, Bacon, and Descartes revolutionized scientific method, among the fruits of which was Harvey's discovery of the circulation of the blood. With the diffusion of juster and more comprehensive notions of structure and function surgery took bolder and more effective flights, reaching her highest point in the 17th century under Richard Wiseman, the father of English surgery, from whose "Seven Chirurgical Treatises" may be gathered the great accession he made to sound prac-

tice, particularly in tumors, wounds, fractures, and dislocations. The lines of scientific surgery were now laid, and her advance became at once safer and swifter. In the 18th century Paris improved on her Collége de St. Côme by her Académie de Chirurgie, long the headquarters of the highest professional and literary culture. England contributed Cheselden and Pott; Scotland, James Douglas, the three Monros, Benjamin Bell, and above all John Hunter, to the promotion of a more enlightened practice, based on anatomical and physiological research. London, Edinburgh, and Dublin became centers of surgical education, which, by the admission of Häser, no continental school, not even Paris, could equal in the sovereign qualities of sagacity in diagnosis and assured boldness in operation. Prussia came far behind with her Collegium Medico-Chirurgicum in Berlin, and Austria only in 1780 and 1785 obtained the means of training surgeons of the higher grade, civil and military; while the United States by her school, under Dr. Shippen in Philadelphia, laid the foundations of its subsequent and nobly sustained proficiency.

To the distinguished anatomists Mascagni and Scarpa in Italy, Breschet and Geoffrey St. Hilaire in France, the brothers John and Charles Bell in Great Britain, the Meckels, Berres, Tiedemann, C. M. Langenbeck in Germany, seconded by physiologists like the Italian Panizzo, the Scotch Charles Bell, the English Marshall Hall, the French Magendie, Flourens, Duchenne, and Bernard, the German Prochaska, Purkinje, the brothers Weber, and Joannes Müller, surgery owes the mighty advance she made in the first decades of the 19th century. Of these pioneers some were themselves surgeons of the first rank, such as Scarpa and the brothers Bell; while among those who were equally great as teachers or writers and operators must be noticed Desault, Dupuytren, Roux, Delpech, and Lallemand in France; Lizars, Allan Burns, Liston, and Syme in Scotland; Abernethy, Astley Cooper, Brodie, and Lawrence in England; Warren, Mott, and Gross in the United States; Wattman, Sicbold, Walther, Chelius, Langenbeck (already mentioned), Stromeyer, Graefe, and Dieffenbach in Germany; Kern, Pitha, and Linhart in Austria; Pirogoff and Szymanovsky in Russia. Anatomico-pathological museums and clinical instruction, displaying a wealth of object lessons impossible before, are among the chief causes of the perfection to which the surgical profession is rapidly attaining. Add to these the introduction of anæsthetics, of the antiseptic ligature and dressing, of the galvano-cautery, of the transfusion of blood, and of the engrafting on patients of tissue taken from the healthy subject, and we can realize the revolution that has so altered the surgeon's art as to make its present position one of the greatest triumphs of human intellect, energy, and resource.

Suriana (named after Josepho Donato Surian, physician at Marseilles), the typical genus of *Surianaceæ*, containing but one species, *S. maritima*. It is a woody plant, with alternate exstipulate leaves, racemose flowers, a five-cleft calyx, five petals, indefinite stamens, five carpels attached to a short gynobase, each cell of the ovary with two seeds. Fruit with a woody pericarp, five cells, each with one ascending seed. Found on the coast of various tropical regions.

Suricate, a South African carnivore belonging to the family of the *Viverridæ*, of which the civet, genette, and ichneumon are representatives, but with much longer legs than these its kin. The body and head reach a length of 12 or 13 inches, the tail 6 inches. There are only four toes, and the claws are very long, suited for burrowing.

Surinam. See GUIANA, DUTCH.

Surinam Poison, in botany, the *Tephrosia toxicaria*, a half shrubby erect plant, with many pairs of leaflets, pubescent above and silky beneath; papilionaceous flowers and linear, velvety, mucronate legumes. It is said to have come at first from Africa, but now grows in the West Indies and Guiana, where the leaves, bruised and pounded, are cast into the water to intoxicate and poison fish.

Surinam Toad, in zoölogy, the *Pipa americana*, a large flat toad, found on the edges of swamps in Surinam and the neighboring country. It is about a foot long, with a short, broad, pointed head, the nostrils produced into a leathery tube; large hind limbs with webbed feet; fore feet small, with four slender webbed fingers, terminating in four small projections. It is brownish-olive above, whitish below; the skin is covered with a number of tiny hard granules, interspersed with horny, tubercular projections. It has no tongue, and the jaws and palate are toothless. The species is propagated in an extremely curious manner. When the eggs are laid, the male impregnates them, takes them in his paws, and places them on the back of the female, where they adhere by means of a glutinous secretion, and become by degrees embedded in a series of cells which then form in the skin. When the process is completed a membrane closes over the cells, and the back of the female bears a strong resemblance to a piece of dark honeycomb. In these cells the eggs are hatched and the young undergo their metamorphosis, bursting through the protecting membrane as perfect frogs.

Surmounted, in architecture, denoting an arch or dome which rises higher than a

semicircle. In heraldry, a term denoting the position of a charge over which another charge of different color or metal is laid. The annexed figures, which may respectively be blazoned: "Sable," a pile argent surmounted by a chevron gules; and "argent," a cross gules surmounted by another "or."

Surmullet, a name of fishes forming the family *Mullidæ*, allied to the perches, and often called red mullets. They have two dorsal fins with a wide interval between them, the first being spinous, and two long barbels hanging from the lower jaw. The common red mullet (*Mullus barbatus*) of the Mediterranean is about 12 inches long, esteemed very delicious food, and was much prized by the Romans.

Surplice, the outer garment of an officiating priest, deacon, or chorister in the Church of England and the Roman Catholic Church, worn over their other dress during the performance of religious services. It is a loose, flowing vestment of white linen, generally reaching almost to the feet, with broad, full sleeves. It differs from the alb in being fuller, and in having no girdle, nor embroidery at the foot.

Surplus, The, the money which annually remains in the Treasury of the United States after the officers of the treasury department have collected the taxes laid on the people by the laws of Congress and have paid all the expenses and obligations of the government, except principal of the interest-bearing debt. The disposition of this surplus has always been an important question, especially when there was no public debt outstanding at the time, or when such debt had not matured, and was, therefore, not redeemable. In 1835 the debt of the United States was $37,733, but the obligations had not been presented for payment. The surplus accumulated and in 1836 amounted to over $40,000,000. It was decided by Congress to apportion this out to those States who would authorize their treasurers to receive the amounts and agree to refund them when demanded. The sum of $5,000,000 was reserved by the government, and the remainder, $37,468,859, was to be paid in four instalments. The first three were paid to all but the few States that had refused to accept it on the conditions proposed. The fourth installment was not paid on account of the financial depression of 1837. The return of these loans to the States has never been demanded.

Another large surplus accumulated in 1852, which was used in the payment of government obligations. The outbreak of the Civil War prevented any surplus for some years. During a period of 26 years, the surplus was smallest in 1874, being $2,344,882.30, and greatest in 1882, being $145,543,810.71. In 1887 it amounted to $103,471,097.69; in 1892 to $26,838,541; and in 1901 to $77,717,984.38.

Surrey, a name given in the United States to a kind of light carriage having two seats in a box mounted on side bars, four wheels, and sometimes a top.

Surrey, Henry Howard, Earl of, an English poet; born about 1516, was the grandson of the Earl of Surrey who was the victor at Flodden, and who, as a reward for his services, was created Duke of Norfolk. He succeeded to the courtesy title of Earl of Surrey when his father became 2d Duke of Norfolk in 1524. The Howards held an eminent position at the court of Henry VIII., and Surrey's cousin, Catherine Howard, became the king's fifth wife. Surrey was one of the leaders of the early poetic movement under Henry VIII. Most of his poems were translations or adaptations of Italian originals. His translations of the second and fourth books of the Æneid are the first attempt at blank verse in the English language. Shortly before Henry's death Surrey and his father were suspected of aiming at the throne, and were arrested and lodged in the Tower, and Surrey was tried, condemned, and executed on Tower Hill Jan. 19, 1547.

Surrogate, generally a deputy, a substitute, a delegate, a person appointed to act for another; specifically, the deputy of an ecclesiastical judge, most commonly of a bishop or his chancellor, who grants marriage licenses and probates. Also an officer who presides over the probate of wills and testaments and the settlement of estates.

Surtees, Robert, an English historian; born in Durham April 1, 1779; was graduated at Oxford (1800), and studied law at the Middle Temple till by his father's death in 1802 he came into the Mainsforth property. Thenceforth he devoted himself to writing his "History and Antiquities of the County Palatine of Durham" (3 vols. 1816–1823), to the fourth volume (1840) of which, completed by the Rev. J. Baine, a "Memoir" by G. Taylor is prefixed. Hill Burton records some excellent *bon-mots* of his in the "Bookhunter," and mentions that he contributed to Scott's "Minstrelsy of the Scottish Border" two "ancient" ballads of his own composing — "The Death of Featherstoubaugh" and "Barthram's Dirge." Surtees died Feb. 11, 1834, and in the same year was founded the Surtees Society for editing unpublished MSS. chiefly relating to the Northern Counties.

Surtout, originally, a man's coat, to be worn over his other garments; now, an upper coat with long wide sleeves; a frock-coat. In heraldry, an escutcheon placed on the center of a shield of arms; a shield of pretense.

Surturbrand, fossil wood, impregnated more or less with bitumen, found in great abundance in Iceland. It is used by the Icelanders chiefly in their smithies. It is sometimes so little mineralized as to be employed for timber.

Surveying, the act or art of determining the boundaries, form, area, position, contour, etc., of any portion of the earth's surface, tract of country, coast, etc., by means of measurements taken on the spot; the art of determining the form, area, surface, contour, etc., of any portion of the earth's surface, and delineating it accurately on a map or plan. Land surveying is the art of applying the principles of geometry and trigonometry to the measurement of land. The principal operations are laying down or driving base lines and triangles on either side of the base. In large surveys it is desirable to lay down these triangles by measuring each angle with an instrument called the THEODOLITE (*q. v.*), by which the accuracy of the measurement of the sides may be checked. Geodesic surveying comprises all the operations of surveying carried on under the supposition that the earth is spheroidal. It embraces marine surveying.

Marine or hydrographical surveying ascertains the forms of coast lines, harbors, etc., and of objects on the shore, the entrances to harbors, channels, their depth, width, etc., the position of shoals, the depth of water thereon; and it embraces all the operations necessary to a complete determination of the contour of the bottom of a harbor or other sheet of water. Mining surveying may be either for the purpose of determining the situation and position of the shafts, galleries, and other underground excavations of a mine already in existence; or it may be for determining the proper positions for the shafts, galleries, etc., of a mine not yet opened. Railway surveying is a comprehensive term, embracing surveys intended to ascertain the best line of communication between two given points; it also includes all surveys for the construction of aqueducts for the supply of water to towns, etc. Topographical surveying embraces all the operations incident to finding the contour of a portion of the earth's surface, and the various methods of representing it upon a plane surface. When only a general topographical map of a country is wanted, it is, in general, sufficient to survey the country with reference to its fields, roads, rivers, etc. Levels are run along the principal lines, as fences, roads, etc., and the highest of the most prominent points of the country are determined with respect to some plane of reference. Then the general outlines of the topography are sketched in by the eye; after the general outline is finished, the principal objects worthy of note are represented by a system of conventional signs.

Surya, the sun god of Hindu mythology.

Sus, in zoölogy, the typical genus of the family *Suidæ,* or the sub-family *Suinæ,* with 14 species ranging over the Palæarctic and Oriental regions, and into the first Australian sub-region as far as New Guinea; absent from the Ethiopian region, or barely entering it on the N. E. The lower incisors are inclined forward, canines of the males tusk-like; the molars have broad crowns with two transverse ridges (three or more in the last molar) divided into rounded tubercles. There are four toes to all the feet; the third and fourth digits form a functional pair, while the second and fifth are rudimentary and do not touch the ground. The genus appears to have commenced in the Miocene Tertiary. *Sus scrofa* (the wild boar) is first found in the Post-Pliocene.

Susa, one of the capitals of ancient Persia; was situated on the Choaspes, and has now been identified with the extensive ruins on the left bank of the Kerkha, about 250 miles S. E. of Bagdad. It had a circumference of 120 stadia, and like Babylon was built of burnt bricks cemented with asphalt. It was without walls, but its citadel, containing the treasury and mausoleum of the Persian kings, was strongly fortified. The founder of Susa is not known with certainty, but it was at least much enlarged by Darius Hystaspes, the ruins of whose palace, repaired by Artaxerxes Longimanus, have been excavated by Loftus and Williams. From the time of Cambyses Susa was a favorite residence of the Persian kings. After Alexander and his successors had fixed their court at Babylon Susa declined in importance, though when besieged by Antigonus in 315 B. C. it was still one of the chief cities of Persia, and even as late as the middle of the 7th century A. D. it offered under Hormuzan an obstinate resistance to the Saracens; but by the 13th century it had become a heap of ruins. The most important of these ruins are those of the palace of Darius, the colonnade of which has a frontage of 343 feet and a depth of 244. In general construction it exactly resembles the Hall of Xerxes at Persepolis. References to Susa abound in the ancient authors, especially Herodotus, Xenophon, and Arrian.

Susa, a town of Northern Italy, on a tributary of the Po, at the foot of the Cottian Alps, 32 miles W. of Turin. It has a cathedral (1029), and a triumphal arch erected by the Romanized Sugusian chief to Augustus in 8 B. C. The people grow fruit and grapes, and carry on iron, leather, and silk industries.

Susannah, in Jewish history, the wife of Joakim, and of the tribe of Judah. She followed her husband to Babylon as a captive. Two elders or judges of Israel cu-

deavored to seduce her, and, failing in their object, they accused her of adultery. She was condemned to death; but Daniel obtained a reversal of the sentence and succeeded in establishing her innocence. This is stated to have occurred in Babylon about 600 B. C.

Susannite (after the Susanna mine, Leadhills, Scotland, where first found), a rhombohedral salt of lead occurring only in small crystals, and very rarely; hardness, 2.5; sp. gr., 6.5–6.55; luster, resinous to adamantine; color, white, green, yellow. Composition: Sulphate of lead, 27.5; carbonate of lead, 72.5 = 100, which yields the formula, $PbOSO_3 + 3PbOCO_2$.

Susiana. See LURISTAN.

Suspecta, in zoölogy, a sub-section of colubrine snakes, having the fangs situated at the back of the jaw behind the common teeth. Head usually covered with shield-like plates. Some are known to be harmless, others are reputed poisonous, though it is doubtful if they really are so. Families *Homalopsidæ, Dipsadidæ,* and *Dendrophidæ.*

Suspended Animation, the temporary cessation of the outward signs and of some of the functions of life.

Suspension, in English and Roman canon law, a censure inflicted on a clerk or priest in orders, for remedial purposes, the effect of which is to take away from him, for a fixed time, or till he repents and makes satisfaction, the exercise of his sacred functions in his office or benefice. Suspension is of three kinds: (1) *ab ordine,* where a clerk cannot exercise his functions; (2) *ab officio,* where he is forbidden to exercise them in his charge or cure; and (3) *a beneficio,* where he is deprived of the revenues of his benefice and of any control over it. Suspension is removed by absolution, revocation of the censure by the person inflicting it, expiry of time, or by dispensation. In English law, the temporary stop of a man's right, as when a seignory, rent, or other profit out of land lies dormant for a time, by reason of the unity of possession of the seignory, rent, etc., and of the land out of which they issue.

In music, the holding or prolongation of a note in any chord into the chord which follows, thereby often producing a discord. The first appearance of the note to be suspended is called its preparation; its presence as a discord, its percussion; its removal to a note of concord or rest in key, or some legitimate sound of a sequence, its resolution. Suspensions are named after the interval of the note forming the discord. Two suspended notes form a double suspension, three a triple suspension and so on. The intervals most commonly suspended are the fourth, sixth, seventh, and ninth. The percussion of a discord of suspension is generally on the strong accent of a bar. In rhetoric, a keeping of the hearer in doubt and in attentive expectation of what is to follow, or what is to be the inference or conclusion from the arguments or observations. Pleas in suspension, in law, those pleas which show some matter of temporary incapacity to proceed with the action or suit. Points of suspension, in mechanics, the points, as in the axis of a beam or balance, at which the weights act or from which they are suspended. Suspension of arms, a short truce or cessation of operations agreed on by the commanders of the opposing forces, as for the burying of the dead, making proposals for surrender, peace, etc.

Suspension Bridge, a bridge sustained by flexible supports secured at each extremity. The points of support are the tops of strong pillars or small towers, erected for the purpose at each extremity of the bridge. Over these pillars the chains pass, and are attached behind them to rocks or massive frames of iron firmly secured underground. These masses of masonry are named anchorages. The flooring is connected with the chains by means of strong, upright iron rods. See BRIDGE.

Suspension Railway, a railway in which the carriage is suspended from an elevated track, one carriage on each side of a single track, so as to balance, or suspended between two tracks. There is an elevated single-track railway in Algeria, where 60 miles of suspension railway are at work, employed chiefly in carrying esparto.

Suspensor, in anatomy, the longitudinal ligament of the liver. In botany, a very delicate thread descending from the foramen of an ovule into the quintine, and bearing at its extremity a globule which is the nascent embryo. It develops from the upper of two cells in a fertilized ovule, of which the lower one becomes the embryo. The suspensor is sometimes long, as in *Boraginaceæ, Cruciferæ,* etc., or short as in *Graminaceæ, Polygonaceæ,* etc. Called also the suspensory cord, the pro-embryo, and by Dutrochet the hypostasis. In surgery, a suspensory bandage.

Susquehanna, a river of the United States, formed by two branches, an E. or N. branch, 250 miles long from Lake Otsego in New York, and a W. branch, 200 miles from the W. slope of the Alleghanies, which unite at Northumberland in Pennsylvania. The united stream flows S. and S. E., and after a course of 150 miles reaches the head of Chesapeake Bay at Port Deposit, Md. It is a wide but shallow stream, nowhere navigable to any extent, except in the spring.

Sussex Marble, a kind of marble geologically constituting two divisions of the

weald clay. The upper, called the large paludina marble, said by Martin to be the true Sussex marble, is characterized by the abundance of *Paludina sussexensis;* the lower one, which occurs about 100 feet below the top of the weald clay and constitutes its most important bed, is full of *Paludina fluviorum*. Sussex marble is of a uniform bluish or grayish green tint, takes a good polish, and has been much used for monuments and in building.

Sussuinum. See FOLDVAR.

Sustentation Fund, in Church history, a fund raised by any religious body to assist its poorer churches, specifically, a fund devised by the Rev. Dr. Thomas Chalmers (1780–1847), and constituted under his direction at the disruption of the Scotch Establishment in 1843. Religious denominations depending solely on voluntary contributions had found it comparatively easy to gather together town congregations able to support their ministers, but to do so in the rural districts was nearly or quite impracticable. Doctor Chalmers aimed at overcoming this difficulty by establishing a fund to which all congregations of the Free Church were expected to contribute according to ability. From this each minister, urban and rural, received an equal dividend. Afterward it was found necessary to modify this part of the plan slightly. While a large number of the ministers had no professional stipend but that received from the sustentation fund, the wealthier congregations in fairly supporting the fund were permitted to supplement the means of their pastor. In various religious bodies in the United States, the same plan has been pursued; but the name sustentation fund has been applied specifically to that form of contribution in Presbyterian Churches.

Susuk, Soosook, or **Soosoo** (*Platanista Gangetica*), the Gangetic dolphin, a cetacean of the delta of the Ganges, closely allied to the fresh-water dolphins, which inhabit the Amazon and other rivers of South America. It has long-beaked jaws, 120 teeth, and very small eyes.

Sutherlandia (named after James Sutherland, who in 1683 published a catalogue of the plants in the Physic Garden in Edinburgh), a genus of *Galegeæ. S. frutescens,* the Cape Bladder senna, is a shrub, having unequally pinnate leaves, large scarlet flowers, and bladdery legumes with many seeds. Its native country is the Cape of Good Hope, but it is cultivated in gardens in other countries. The dried and pulverized roots and leaves have been used in diseases of the eye.

Sutlej, one of the five rivers of the Punjab, in Northwestern India; identified both with the Zaradras and the Hypanis of the Greeks. It rises in the lake of Manasavara, amid the Central Himalayas, nearly 20,000 feet above the sea-level, and first flows N. W. for about 200 miles through stupendous mountain gorges; it is then joined by the Spiti, a tributary larger than the main stream, and turns S. E. In this part it is occasionally crossed by suspension bridges of rope and iron. Passing Rampur and Bilaspur, it enters the plains of the Punjab at Rupur, where it is 30 feet deep and more than 500 yards wide in the rainy season. It receives the Beas a little above Sobraon, after a total course of 550 miles. Thenceforth the united stream is known as the Gharra, taking the new name of the Punjab after its junction with the Chenaub, up to the point where it finally empties itself into the Indus opposite Mittunkote. The principal town on its bank is Ferozpur. Its waters are largely used for irrigation. It is celebrated in history as forming the E. frontier of the Punjab, within which Runjeet Sing was confined. The crossing of the Sutlej after his death by the Sikh army occasioned the first Sikh war of 1843, and on its banks many bloody battles were fought. The Upper Sutlej canals have a total length of 213 miles, and irrigate 135,439 acres in the district of Lahore and Montgomery. The Lower Sutlej and Chenaub canals, in the Multan district, are 632 miles long, and water 242,504 acres.

Sutler, a person who follows an army and sells to the troops provisions, liquors, or the like. The sutlers attached to regiments in the French army are called *vivandiers.*

Sutras, certain books of aphorisms composed by the Brahmans, which are declared to be founded on the Vedas and the Brahmanas, though they did not contend that they were directly inspired. In these writings they developed the system of sacrifice, and raised to a greater height their own caste pretensions. The Sutras taken collectively constituted the Vendangas.

Sutro, Adolph Heindrich Joseph, an American mining engineer; born in Aix-la-Chapelle, Prussia, April 29, 1830; came to the United States in 1850 and settled in San Francisco, Cal. There he engaged in business till 1860, when he conceived the plan of the great "Sutro tunnel," as a means of developing the Comstock mine in Nevada. He interested capitalists in the project and work was begun on the tunnel in 1869. His contract with the mine-owners called for $2.00 royalty on every ton of ore taken from the mines, and when the work was completed in 1879 he was paid about $15,000.00. He sold out his interest in the tunnel; went to San Francisco, invested in real estate, and soon became one of the wealthiest men on the Pacific slope. He was a donor of large sums of money to public institutions; founder of the Sutro Library, of San Francisco and

mayor of that city in 1894. After his death there, Aug. 8, 1898, his will, in which he bequeathed nearly his whole fortune to the city, was contested and broken.

Sutro, Florence Clinton, an American musician; born in England; was graduated at the Grand Conservatory of Music in New York with the degree of Mus. D., being the first woman in the United States to receive that degree, and at the Law School of the University of New York. She was a member of numerous literary, musical, and social societies; honorary president of the Grand Conservatory Alumnæ; president of the Hospital for Crippled Children, and prominent as a writer for the advancement of women as composers and musicians. She founded the National Federation of Musical Clubs and Societies in 1898. Died in 1906.

Suttee, a form of widow sacrifice (itself a form of funeral sacrifice), formerly common in Brahmanic India, in which the widow was burnt with her dead husband on the funeral pyre. Many went willingly and gayly to their doom, but others were driven by fear of disgrace, by family influence, by priestly threats, and, in not a few cases, by sheer violence. Suttee was abolished by law in British India Dec. 4, 1829, but scarcely a year passes by free from its being carried out in some of the native principalities, and between 1813 and 1828, in Calcutta, the suttees ranged from 390 to 600 yearly. When the question of prohibiting suttee was under discussion, the Brahmans quoted the Rig Veda in favor of the practice; but it was shown by Professor Wilson that the text had been falsified. But though suttee was expressly prohibited by the ancient Brahmanic funeral rites, and the widow, after ascending the funeral pile, was to be led down by a brother-in-law, this symbolic form points to an earlier period when the sacrifice was really carried out. The revival must have taken place at a remote date; for Propertius graphically describes it, and vividly contrasts the behavior of Indian with that of Roman wives.

Sutter, John Augustus, an American pioneer; born in Kandern, Germany, Feb. 15, 1803; was graduated at the Berne Military Academy in 1823; settled in St. Louis, Mo., in 1834, but soon removed to Santa Fé, where he engaged in a lucrative trade with trappers and Indians. Receiving favorable accounts of California he crossed the Rocky Mountains in 1838; sailed down the Columbia river and thence to Hawaii. After going to Sitka, Alaska, he cruised along the Pacific coast and was stranded at the site of San Francisco in July, 1839. During that year he established the first white settlement on the site of Sacramento. In 1841 after receiving a large tract of land from Mexico, he built a fort which he named New Helvetia; was made governor of the frontier country by Mexico, but was held in suspicion by the Mexicans owing to his friendly feelings toward the United States. In 1848 when California was ceded to the United States, he owned many thousand head of cattle, much land, and other property, but owing to the discovery of gold on his estates was overrun by miners, and his workmen left him, and not being able to secure others he was financially ruined. He appealed to the Supreme Court, but was not sustained. Later the Legislature of California granted him a pension of $250 a month. He moved to Litiz, Pa., in 1873. He died in Washington, D. C., June 17, 1880.

Sutton, Rhoades Stansbury, an American physician; born in Indiana, Pa., July 8, 1841; was graduated at Washington and Jefferson College in 1862, and at the Medical Department of the University of Pennsylvania in 1865. He was major of volunteers and surgeon in the army during the American-Spanish War. His publications include many contributions to technical periodicals. He died in 1906.

Sutural Dehiscence, in botany, dehiscence along one or more sutures. If the dehiscence is along the ventral suture the fruit is a follicle, if along the dorsal and ventral sutures it is a legume. There are no dissepiments, the fruit being composed of only one carpel.

Suture, in ordinary language, the act of sewing; the line along which two things are joined, united, or sewed together, so as to form a seam, or something resembling a seam. Technically, in anatomy, the immovable junction of two parts by their margins; as, the sutures of the skull, *i. e.*, the lines of junction of the bones of which the skull is composed. Various types of suture exist, as the serrated or dentated suture, the squamous or scaly suture, and the harmonic suture or harmonia. Arranged according to their situation, there are coronal, frontal, fronto-parietal, occipito-parietal, and many other sutures. In botany, the line formed by the cohesion of two parts. If the suture formed by the carpellary leaves in a pistil face the center of a flower, it is called the ventral suture; if it face the perianth, the dorsal suture. The former corresponds to the margin, and the latter to the midrib of the carpellary leaf. In entomology, the line formed by the meeting of the elytra of a beetle when they are confluent. In surgery, the uniting of the lips or edges of a wound by stitching. In zoölogy, the outlines of the septa in the Tetrabranchiata, from their resemblance to the sutures of the skull. When these outlines are folded, the elevations are called saddles, and the intervening depressions lobes.

Suvorof=Rymnikski, Peter Alexis Vassilivich, Count of, Prince Italiski, a Russian military officer; born in Finland, Nov. 25, 1729; and in his 17th year entered the service as a common soldier. He served in the war against Sweden, in the Seven Years' War, in Poland, and against the Turks, giving many proofs of courage and conduct, and obtaining the rank of lieutenant in 1754, of lieutenant-colonel in 1763, of Brigadier-General in 1768, and of General of Division in 1773. In 1783 he reduced the Kuban Tartars under the Russian yoke. In 1787, as chief in command, he conducted the defense of Kinburn to a successful issue; and in 1789 he gained the dignity of count by his great victory on the banks of the Rymnik, where the Austrian troops under the Prince of Saxe-Coburg, were surrounded by 100,000 Turks. By his timely arrival with 10,000 Russians he not only rescued the Austrians, but occasioned the utter overthrow of the enemy. The next, and perhaps the most sanguinary of his actions, was the storming of Ismail in 1790, which was followed by the indiscriminate massacre of 40,000 of the inhabitants of every age and both sexes. He was next employed against the kingdom of Poland, and conducted a campaign of which the partition of the country was the result, receiving a field-marshal's baton, and an estate in the dominions which he had contributed to annex to the Russian crown. The last and most celebrated of his services was his campaign in Italy in 1799, when his courage and genius for a while repaired the disasters of the allied forces. He gained several brilliant victories at Piacenza, Novi, etc., drove the French from all the towns and fortresses of Upper Italy, and was rewarded with the title of Prince Italiski. But in consequence of a change in the plan of operations he passed the Alps; and the defeat of Korsakof at Zürich, together with the failure of the expected assistance from the Austrians, obliged him to retreat from Switzerland. On his recall to Russia preparations were made for his triumphal entry into St. Petersburg; but having incurred the displeasure of the Emperor Paul, the preparations for his triumph were suspended. Chagrin at this disgrace hastened his death which took place May 18, 1800.

PETER A. V. SUVOROF-RYMNIKSKI.

Suwalki, a province of Russian Poland, bounded W. by Eastern Prussia, S. by Grodno, and separated by the Niemen on the N. from Kovno, on the E. from Wilna; area, 4,846 square miles; pop. (1897) 604,945. The surface is mountainous in the W. and S., and one-eighth is in swamp. Timber and grain are produced. Suwalki, the capital, is situated on the Hancza, 65 miles S. W. of Kovno.

Suwannee River, a river in Southern Georgia, in the Okefinokee Swamp, which flows in a winding, generally S. S. W. course through Florida into the Gulf of Mexico. It is the subject of a long popular ballad.

Suwarrow Islands, a group of three low wooded islands in the Pacific, about 450 miles N. N. W. of Cook or Hervey Islands, and about the same distance E. of Samoa. Annexed to Great Britain in 1889.

Suzerain, in feudalism, a lord paramount; either the king, as original holder of the realm, or his immediate vassals, as grantors in turn to sub-vassals.

Svanbergite, a rare mineral occurring only in crystals and crystal grains. Crystallization, rhombohedral; hardness, 5.0; sp. gr. 3.30; color, honey-yellow, shades of brown, rose-red; luster, vitreous. Composition: Uncertain; apparently essentially a combination of a phosphate and a sulphate of alumina, lime, and soda, with some water. Found at Horrsjöberg, Wermland, Sweden.

Svastika, a religious symbol used by early races of Aryan stock from Scandinavia to Persia and India. It consists of a Greek cross, either enclosed in a circle the circumference of which passes through its extremities or with its arms bent back, and was intended to represent the sun, being found invariably associated with the worship of Aryan sun gods (Apollo, Odin). Similar devices occur in the monumental remains of the ancient Mexicans and Peruvians, and on objects exhumed from the prehistoric burial mounds of the United States.

Sveaborg, a fortress in Finland; sometimes called "the Gibraltar of the North" protects the harbor and town of Helsingfors, from which it is 3 miles distant. The fortifications were planned and first prepared by Count Ehrensvärd in 1849, and there are an arsenal, docks, slips, and a monument to the "father" of the fortress. The fortifications were betrayed into the hands of the Russians by the Swedish commandant in 1808.

Svendsen, Johan Severin, a Norwegian composer; born in Christiania, Norway, Sept. 30, 1840. He studied at Leipsic, Paris, and in Italy, conducted concerts in his native town and in 1883 became master of the Chapel Royal. Copenhagen. Besides his beautiful and well-known "Romance in G." for violin and orchestra, his compositions include

symphonies, an overture, and quartets, quintets, and concertos for strings.

Swahili, the name given to the people of Zanzibar and the opposite coast belonging to the Bantu stoek, with an Arab infusion, and speaking a Bantu tongue modified by Arabic. The Swahili are intelligent and enterprising, and are in demand as porters by travelers into Central Afriea. There is a eollection of Swahili folk tales (1869) and a handbook by Bishop Steere (1871); and a dictionary by Krapf (1882).

Swain, George Fillmore, an American civil engineer; born in San Francisco, Cal., Mareh 2, 1857; was graduated at the Massachusetts Institute of Teehnology in 1877 and then studied in Berlin, Germany. He aeeepted the ehair of civil engineering at the Massaehusetts Institute of Technology in 1877. He is the author of "Notes on Hydraulies" (1885); "Notes on Theory of Struetures" (1893); several chapters in Vol. XVI. of the Tenth Census of the Unived States, ineluding" Water Power of the Southern Atlantic Watershed of the United States," "The Water Power of Eastern New England"; and the "Water Power of the Middle Atlantie States," etc.

Swain, Joseph, an Ameriean educator; born in Pendleton, Ind., June 16, 1857; was graduated at the Indiana University in 1883, and taught there first as instructor in biology, then as assistant Professor of Mathematies in 1883–1886, and finally as full professor in 1886–1891. He was ealled to fill a chair in the Leland Stanford University in 1891, was president of the Indiana University in 1893-1902, then president of Swarthmore College. He was the author of numerous seientific papers and was long prominent in conneetion with various educational organizations.

Swallow, in ornithology, any one of the numerous passerine birds of the family *Hirundinidæ.* In the United States the best known species are the barn swallow; the cliff, eaves, or chimney swallow; the white bellied or tree swallow, and the bank swallow. The speeies usually deseribed by naturalists as the type of the family is *Hirundo rustica,* a well-known European visitor, whose arrival from Afriea (usually about the middle of April) is eagerly looked for as a sign of approaehing summer. Swallows usually arrive in pairs — a male and a female — though several pairs often form a small flight; but if a single bird is seen to arrive, there is a strong presumption that it has lost its mate. They return with unfailing regularity to their old haunts, and in May commence building their nests which are in shape somewhat like a flattened cup, divided perpendieularly; they are made of clay, mud, and straw, lined with horsehair or feathers, and the eggs, which are from four to six in number, are white, spotted with a purply-red. The food of the swallow eonsists entirely of winged inseets; on their arrival, these birds feed exelusively on gnats and flies, in summer small beetles are very largely taken. These are captured as the birds fly with open mouth, the bristles with which the gap is supplied and the viscid saliva assisting to retain the prey. Like owls, swallows reject the undigested portions of their food in small pellets or eastings. It was formerly believed that swallows hibernated in tem-

SWALLOWS.

perate climates, but the fact of their migration is proved beyond a doubt, and the old belief has almost, if not entirely, died out. The male is about eight inches long; beak blaek, forehead, chin, and throat, chestnut; head, neek, baek, rump, and upper tail eoverts steel-blue; tail very mueh forked; under surface buffy-white, legs and toes slender and black, claws blaek and sharp, In the female the tail feathers are not so long, nor are they developed in the young birds till they have left Europe for the S. The note of the swallow is a low musieal twitter.

Swallow Holes, in geology, deep vertical pits oeeurring upon broad surfaees of limestone, espeeially where it alternates with shale. They are produced by rills of water or by rain, and often are seen at brief intervals for miles, marking the strike of the limestone, even when obseured by aeeumulations of other material upon its surface. They sometimes deseend into caverns, espeeially in the scar limestone.

Swallow Shrike, in ornithology, a popular name for any individual of the family *Artamidæ.* They resemble swallows in their actions and general mode of life, while in the shape of their bills they exhibit great affinities to some of the shrikes and erow shrikes.

Swallowtailed Butterfly and **Moth,** names given to the *Papilio Machaon,* a beautiful species of butterflies, and to the *Durapteryx sambucaria,* a common moth, so called because the hinder wings are prolonged into small tails.

Swallowwort, in botany: (1) *Chelidonium majus,* so named, according to Aristotle and Dioscorides, because swallows use it to restore the eyesight of their young ones, or in the opinion of others because the plant begins to bloom at the time when swallows arrive and goes out of flower at the time of their departure. (2) The genus *Asclepias.* (3) *Thapsia asclepium.* (4) *Ranunculus ficaria.* (5) *Fumiria bulbosa.* (6) *Caltha palustris.* (7) *Saxifraga granulata.*

Swammerdam, John, a Dutch naturalist; born in Amsterdam, Holland, Feb. 12, 1637, and was destined for the Church, but embraced the profession of medicine. He was devoted especially to the study of insects; and his "General History of Insects" and other works laid the foundations of the modern science of entomology. He died in Amsterdam Feb. 15, 1680.

Swamp Angel, The, an 8-inch Parrott gun, so named by the Federal soldiers. It was mounted on a battery constructed on piles driven into the swamp near Charleston, S. C., and was used in the siege of that city. It burst Aug. 22, 1863, and was sent with a lot of old metal to Trenton, N. J., to be melted up. By some means the gun was recognized, was rescued from its impending fate and set on a granite base on the corner of Perry and Clinton streets in the city of Trenton.

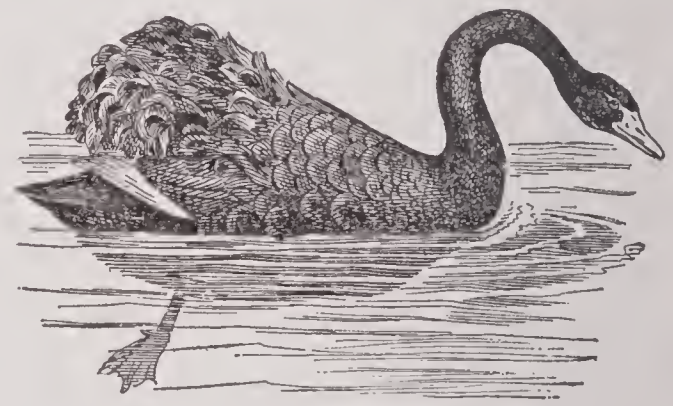
Swamp Deer, in zoölogy, the *Rucervus duvaucelli,* from India and Assam. It is about four feet in height, rich light yellow in color, and congregates in large herds in moist situations. The antlers are large, with a long beam which branches into an anterior continuation of the main portion, and a smaller posterior tyne which is bifurcated.

Swamp Hellebore, the *Veratrum viride.* The bracts are oblong-lanceolate, the partial ones larger than the petiole, which is downy; the flowers in panicled racemes. Grows in North American swamps from Canada to South Carolina. Called also American or green hellebore and Indian poke.

In pharmacy, tincture of swamp hellebore, made by adding to the rhizome rectified spirit, is used to act on the vascular system in inflammatory diseases, specifically in rheumatic fever and gout.

Swamp Hickory, the *Carya amara;* a North American tree with small ovate fruits, the rind of which remains permanently fleshy. The kernel is very bitter; hence the tree is sometimes called bitter nut.

Swan, in ornithology, any individual of the genus *Cygnus.* The swans form a sharply-defined group; the body is elongated, the neck very long, head moderate; beak about as long as head; legs short, and placed far back. On the under surface the plumage is thick and fur like; on the upper side the feathers are broad, but both above and below the body is thickly covered with down. Their short legs render their movements on land awkward and ungainly, but in the water these birds are graceful to a proverb. Their food consists of vegetable substances and weeds, their long necks enabling them to dip below the surface and to reach their food at considerable depths. Swans breed in high latitudes, but the domesticated species, *Cygnus olor,* the mute swan, breeds on cyots and the shores of lakes, making a very large nest on land, in which five or six greenish eggs are deposited. The young generally are covered with a gray down till the age of two years, when they assume the characteristic white plumage of the older birds. Three other species visit temperate Europe: the elk, hooper, whooper, or whistling swan (*C. musicus*); Bewick's swan (*C. bewicki*), and the Polish swan (*C. immutabilis*), which owes its specific name to the fact that the cygnets are pure



COMMON SWAN.

white like the parent birds. The mute swan is the largest and most majestic of the four, and is easily recognized by the black knob at the base of the bill. There are some other species, chiefly from North America, but the most beautiful of the whole genus is the black-necked swan (*C. nigricollis*), from South America; while the most remarkable is the black swan (*C. atratus*), from Australia, first taken to other countries early in the 17th century. So convinced were the ancients that white plumage was of the essence of a swan, that a "black swan" was a proverbial expression for something extremely rare — if not for the non-existent — from the days of Juvenal to those of Sir

Thomas Browne. The stories about the musical voice of the swan, though greatly embellished by early writers, appear to have some foundation in faet so far as regards the whooper (*C. musicus*). T. Rymer Jones says, "The dying swan, we find, has nothing peculiar in its notes, but its last erics may be as loud and musieal as any others to whieh it has given utteranee." In astronomy, the eonstellation CYGNUS (*q. v.*). Figuratively applied to a famous poet; thus Shakespeare is ealled the Swan of Avon, Vergil the Swan of Mantua.

Swan, Joseph Rockwell, an Ameriean jurist; born in Westernville, N. Y., Dee. 28, 1802; settled in Columbus, O., in 1824, and was there admitted to the bar. He began praetiee in Franklin and the adjacent eountry; was prosecuting attorney in 1830–1834, and judge of the Court of Common Pleas in 1834–1845. He then practised till 1854 when he beeame judge of the Supreme Court. In 1859 he rendered his most important decision. The United States Distriet Court in Ohio had sentenced a prisoner for violating the Fugitive-Slave Law. Under a writ of habeas eorpus the Supreme Court of the State sought to set aside the sentence, but it was sustained by Judge Swan, who deelared that the State eould not reverse the deeisions of the United States Courts. In 1860 he was made president of the Columbus and Xenia railroad. His publieations include "Treatise on Justices of the Peaee and Constables in Ohio" (1836); "Statutes of Ohio" (1841); "Manual for Exeeutors and Administrators" (1843); "Practiee in Civil Aetions and Proceedings at Law in Ohio and Preeedents in Pleading" (1845); "Swan's Pleadings and Praetiee" (1851); "Commentaries on Pleadings under the Ohio Code" (1860); and "Supplement to the Revised Statutes of Ohio, ete., in Force August, 1868." He died in Columbus, O., Dee. 18, 1884.

Swanage Clay, a thin deposit of Middle Purbeck age, very remarkable for the fossil remains of mammalia whieh it eontains, about 15 speeies having been deseribed by Dr. Faleoner and Professor Owen. Only about eight speeies besides have been obtained from the whole range of Secondary rocks. They appear for the most part to be referable to insectivorous marsupials.

Swank, James Moore, an American statistician; born in Westmoreland co., Pa., July 12, 1832; received an aeademic education and studied at Jefferson College. In 1853 he established and for many years edited and published the Johnstown "Tribune"; in 1871–1872 he was ehief clerk of the United States Department of Agrieulture. He was made secretary of the American Iron and Steel Assoeiation in 1873, and in eonnection with this offiee its general manager in 1885. He early became a strong advoeate of the poliey of proteetive tariff. His publieations inelude "History of the Department of Agrieulture" (1872); "Iron Making and Coal Mining in Pennsylvania" (1878); "History of the Manufacture of Iron in all Ages" (1892); "Notes and Comments on Industrial, Eeonomie, Politieal, and Historical Subjeets" (1897); and many tariff tracts. For several years he eontributed the section on "Iron and Steel" in the annual report on "Mineral Resources of the United States" issued by the United States Geologieal Survey.

Swan Maiden, a supernatural being in the shape of a swan, fabled to have the power of assuming the figure of a beautiful young woman by taking off the swan coat or swan shift. Many of these swan maidens are said to have contraeted marriage with men who had obtained power over them by getting possession of the swan eoat or swan shift, but if the swan maiden reeovers this from her husband, even though she may have borne him ehildren she assumes her former shape and flies away from him forever. See VALKYR.

Swan River, a river in Western Australia, which colony was originally known as the "Swan River Settlement." Perth, the eapital of the colony, is on the Swan river, and Freemantle is at its mouth.

Swansdown, a name for a fine, soft, thick, woolen cloth; or more commonly for a thick eotton eloth with a soft nap on one side.

Swansea (Welsh, Abertawe), a seaport of Glamorganshire, South Wales, on the banks and at the mouth of the Tawe river, 45 miles W. N. W. of Cardiff and 216 W. of London. A munieipal, parliamentary, and also (since 1888) county borough, it is the most important town in South Wales. Its rapid progress depends on the manufaeture of tin plate here and in the neighborhood; on its harbor and docks whieh afford every eonvenienee for the largest vessels and steamships afloat; and on its geographieal position, on a bay affording a spaeious, sheltered, and safe anehorage, several hours nearer the open sea than any other port of eomparable size in the Bristol Channel. The Harbor Trust of Swansea, with a capital of $7,500,000 and an ineome of upward of $500,000 per annum, possesses doeks construeted since 1847 eovering an area of over 60 acres. There is annually manufaetured in Swansea and the immediate neighborhood upward of two-thirds of the tin plates manufaetured in Great Britain representing a value of upward of $25,000,000. There is still a large direet export trade to the United States in tin and (the

inferior) terne plates, though this branch of trade was much injured by the tariff legislation of 1890. The chief imports are copper, silver, lead, tin, and nickel, with their ores and alloys, iron and steel in various forms, iron ore, zinc, sulphur, phosphates, flour, grain, esparto, timber bricks, etc. The chief exports are tin, terne, and black plates, coal and coke, copper, zinc, and their ores, iron and steel, alkali, superphosphate, arsenic, etc. The total tonnage entered and cleared in 1898, exclusive of coastwise traffic was 1,659,696. The charter dates from the days of King John and Henry III., renewed by subsequent sovereigns. The castle, of which a tower still remains, was founded in 1099 by the Earl of Warwick, but in the reign of Edward IV. passed by marriage from the Herberts to the Somerset family, and is still the property of the Dukes of Beaufort. The grammar school dates from 1682. Pop. (1901) 94,505.

Swat, or **Suwat,** a region in Central Asia, W. of the upper Indus river. It is but little known. Its ruler is a chief called the Akhoond.

Swatau, a seaport of China which has been opened to foreign trade since 1869; at the mouth of the Han river, 225 miles E. of Canton, in the province of Kwangtung. It is the seat of great sugar refineries, and bean cake and grass cloth manufactures. Its trade has grown but slowly; in 1869 it reached a total of $24,000,000, in 1889 of $25,850,000, and in 1890 $32,000,000. The imports which consist principally of bean cake and beans, cottons, opium, rice, metals, hemp, silks and woolens, and wheat, amounted in 1898 to about $8,799,589. Sugar forms the chief item among the exports; besides it tobacco, cloth and nankeens, joss paper, grass cloth (made from a kind of hemp fiber), and tea are sent abroad; the exports in 1898 amounted to about $2,819,464. Pop. (1905) customs estimate, 60,000.

Swayne, Noah Haynes, an American jurist; born in Culpepper co., Va., Dec. 7, 1804; was admitted to the bar in 1823; settled in Coshocton, O., in 1825; and was prosecuting attorney of the county in 1826–1829. In the latter year he became a Democratic member of the Ohio Legislature. He was United States district attorney for Ohio in 1831–1841; then resumed practice. One of his most important cases was the trial of William Rossane and others who about 1853 had burned the steamboat "Martha Washington" hoping to collect insurance. He often also appeared as counsel in fugitive-slave cases and on account of his anti-slavery views joined the Republican party on its formation. He was an associate justice of the United States Supreme Court in 1862–1881. In the latter year he resigned owing to advanced age. He died in New York city June 8, 1884.

Swaziland, a South African native State; on the W. side of the Libomba Mountains, and forming geographically an intrusion into the E. side of the Transvaal Colony. It has an area of 8,500 square miles; a pop. (1904) of 85,419, of whom 890 were Europeans and whites; and a trade valued at $350,000 through Natal, exclusive of what goes by way of Delagoa Bay. The independence of this little State was recognized by its powerful neighbors, the South African republic (now the Orange River Colony) and the British government, in 1884; in 1890 the white settlers, mainly gold miners, were put under joint "government committee," appointed by Great Britain and the Boers; and after 1895 Swaziland was under the protection of the Republic. The Swazis, a Zulu-Kaffir race, smelt copper and iron, and are noted for their wood-carving.

Swearing, the habit of using the name or attributes of God in a light and familiar manner by way of asseveration or emphasis. It was specially condemned by the Mosaic law, was long punished by severe penalties, and is still an actionable offense in England. By oaths are loosely understood many terms and phrases of a gross and obscene character, as well as those words the use of which specially implies profanity proper. Again, there is a legitimate use of imprecations and curses when intense hatred is to be expressed, and when it is justifiable. It is only taking the sacred name in vain that need be condemned, and we know how at my Uncle Toby's one oath "the recording angel dropped a tear on the word and blotted it out forever." It is hardly necessary to say how natural it is for weak men of limited vocabulary, under the pressure of excitement, to seek for artificial strength or verification by employing irrelevant words that carry with them ideas of gravity or strength. Seafaring men and persons in command generally, often use such expressions to add weight to their words, and some apology may be found for them in the fact that the persons with whom they have usually to deal have been so accustomed to their use as not to be readily inclined to obedience without them. Again, other and more imaginative men, alike in the United States and England from the days of Rabelais till now garnish their talk with oaths as a mere exercise of verbal ingenuity, or by way of offset to their conversation. "How now?" said Ponocrates, "you swear, Friar John"; "It is only," said the monk, "but to grace and adorn my speech; they are colors of a Ciceronian rhetoric."

To call God to witness is a thing natural enough on occasions of grave asseveration.

as in giving witness in courts of law and the like, and it has been from the beginning a custom to take oaths on things sacred or august, as the head of the emperor, the beard of the prophet, the sword blade or hilt, and the Gospels.

Swift's "Swearer's Bank" (Scott's "Swift," vol. vii.) is a characteristic satire on the profanity of his day. It is computed by geographers, he begins, that there are 2,000,000 in this kingdom (Ireland), of which number there may be said to be 1,000,000 of swearing souls. It is thought that there may be 5,000 gentlemen, each with one oath a day at a shilling each, yielding an annual revenue of $456,250. All classes of citizens contribute to this revenue, the farmers, the commonality, the hundred pretty fellows in Dublin alone at 50 oaths a head daily, the oaths of a little Connaught fair themselves computed at 3,000. Militia under arms are to be exempted, nor is any advantage to be taken of any man's swearing in the Four Courts, provided he is at hearing in the exchequer or has just paid an attorney's bill. As for its medicinal use to help the lungs to throw off any distilling humor, on certificate of a course of swearing granted by any physician a permit may be issued to the patient, but all other licenses, compositions, or indulgences whatever are prohibited.

The Church ever denounced profane swearing, but was powerless to check the practice. St. Chrysostom spent 20 homilies on it, and St. Augustine's judgment is summed up with unnecessary severity in the solemn passage, "Not less do they sin who blaspheme Christ reigning in heaven, than did they who crucified Him walking about on earth." For much of our popular swearing is little more than the mere habit of vocabulary, a sin only from the lips outward, as Bishop Lightfoot said of the habitual profanity of the colliers of his diocese. Again, where swearing is a professional custom it is scarce possible to exist without conforming, and after all words have in themselves no absolute but a relative meaning. "Our armies swore terribly in Flanders" in my Uncle Toby's time, nor was the practice extinct till long after the great French wars. And have we not still our familiar proverb "to swear like a trooper." But swearing has disappeared from the parade ground, though it still lingers in the barrack room. "To swear like a bargee," however, is a proverb still justifiable by the facts — an atmosphere of oaths continues to hang heavy over canals and rivers. We are told that Robert Burton at last could only be made to laugh by going down to the Bridgefoot in Oxford and hearing the bargemen scold and storm and swear.

The old forms of excommunication in ecclesiastical use supplied forms enough, and the specimen of the powers of Ernulphus given in "Tristram Shandy" certainly displays "an orientality we cannot rise up to, a copiousness of invention, a possession of all the excellencies of a swearer which make it impossible to swear out of it." The advantage of a theological vocabulary is seen further in Scott's story of the swearing bout between a skipper and a broken-down minister, where the latter swore his antagonist dumb with a copiousness and variety he could not equal. In England the growth of Puritanism was marked by a series of attempts to stamp out swearing. In 1601 a measure for this end was introduced into the House of Commons and one was carried in 1623. "Not a man swears but pays his 12 pence," says Cromwell proudly of his Ironsides. As early as 1606 swearing in plays had been forbidden, and even Ben Jonson himself narrowly escaped the $50 penalty. An act of 1645 in Scotland details the penalties to be inflicted, even on ministers of religion — it will be remembered that Barham recommends these not to go beyond "zooks." Shirley's play, "The Young Admiral" (1633), is especially noted as "free from oaths, profaneness, and obsceneness." When Davenant's "Wits" next year was presented to Sir Henry Herbert for license, the latter crossed out many expressions. Davenant appealed to the king who directed the Master of the Revels to allow such words as "Faith," "Death," and "Slight." Sir Henry made the following entry in his office book: "The king is pleased to take "Faith," "Death," and "Slight" for asseverations and no oaths, to which I do humbly submit as my master's judgment; but under favor conceive them to be oaths, and enter them here to declare my opinion and submission." St. Paul's Cathedral is supposed to have been built without an oath, the regulations of Sir Christopher Wren being so stringent, and this may be allowed to remain its most remarkable distinction.

Sweat, the name given to the perspiration or skin secretion separated from the blood by the sudoriparous glands or sweat glands. The ordinary perspiration is named insensible on account of its being continually given off from the skin by evaporation; the increased secretion of sweat, dependent on exertion and which appears in the form of drops of fluid collected on the surface of the skin, being named sensible sweat. This secretion consists of water, carbonic acid, urea, mineral matters, and sebaceous matter — the latter obtained from the glands of that name existing in the skin. The principal salts in sweat are the chlorides of sodium and potassium, with alkaline phosphates, and sulphates. Traces of oxide of iron also occur in the secretion. The quantity of watery vapor daily excreted

by the skin under ordinary circumstances amounts to between 1½ and 2 pounds. Occasionally in some diseases (*e. g.*, jaundice) the sweat may be colored by other secretions, while sanguineous or bloody sweat is not unknown; the cause of its production being, however, obscure. See SKIN.

Sweating Sickness, an extremely fatal epidemical disorder which ravaged Europe, and especially England in the 15th and 16th centuries. It derives its name "because it did most stand in sweating from the beginning till the endyng," and, "because it first beganne in Englande, it was named in other countries the Englishe sweat." It first appeared in London in September, 1485, shortly after the entry of Henry VII. with the army which had won the battle of Bosworth Field on Aug. 22. It was a violent inflammatory fever which after a short rigor, prostrated the powers as with a blow, and, amid painful oppression at the stomach, headache, and lethargic stupor, suffused the whole body with a fetid perspiration. All this took place in the course of a few hours and the crisis was always over within the space of a day and night. The internal heat which the patient suffered was intolerable, yet every refrigerant was certain death. "Scarce one among a hundred that sickened did escape with life" (Holinshed)—a statement which, while probably greatly exaggerated, illustrates the dread with which the malady came to be regarded. Two lord mayors of London and four aldermen died within one week; and the disease for the most part seized as its victims robust and vigorous men. It lasted in London from Sept. 21, to the end of October, during which short period "many thousands" died from it. The physicians could do little or nothing to combat the disease, which at length was swept away from England by a violent tempest on New Year's Day.

In the summer of 1508 it reappeared in London, and in July, 1517 it again broke out in London in a most virulent form, carrying off some of those who were seized by it within four hours. It seems chiefly to have attacked those in the upper classes or in comfortable circumstances. In many towns a third or even a half of the inhabitants are said to have been swept away, again probably an overstatement. On this occasion the epidemic lasted about four months. In May, 1528—the year in which the French army before Naples was destroyed by pestilence, and in which the putrid fever known as *Trousse-galant* decimated the youth in France—the sweating sickness again broke out in London, spread rapidly over the whole kingdom. "and 14 months later brought a scene of horror on all the nations of Northern Europe, scarcely equaled in any other epidemic." How many lives were lost in this epidemic which has been called by some historians "the great mortality," is unknown; the fact that King Henry VIII. left London and endeavored to avoid the disease by continually traveling, shows the general feeling of alarm that existed. We hear of it at Calais in the same year, but nowhere else out of England.

The following summer, having apparently died out in England, it appeared in Germany, first at Hamburg, where it is recorded that 8,000 persons died of it, and shortly after at Lübeck, Stettin, Augsburg, Cologne, Strassburg, Hanover, etc. In September it broke out in the Netherlands, Denmark, Sweden, and Norway, whence it penetrated into Lithuania, Poland, and Livonia; but after three months it had entirely disappeared from all these countries. For 23 years the sweating sickness totally disappeared, when for the last time (March or April, 1551) it burst forth in Shrewsbury, spread rapidly over the whole of England, but disappeared by the end of September. The deaths were so numerous that one historian (Stow) states that the disorder caused depopulation of the kingdom. The very remarkable observation was made in this year that the sweating sickness uniformly spared foreigners in England, and on the other hand followed the English into foreign countries. The immoderate use of beer among the English was considered by many as the prineipal reason why the sweating sickness was confined to them. Since 1551 the disease has never appeared as it did then and at earlier periods. Its nearest ally is sudamina or miliary eruption, which has appeared in frequent, but usually limited, epidemics in France, Italy, and Germany (still called there "the English sweat"), during the 18th and 19th centuries, sometimes, as in the department of Vienna in 1887, in so severe and even fatal a form as to suggest the older epidemic in miniature.

Sweating System, the system by which sub-contractors undertake to do work in their own houses or small workshops, and employ others to do it, making a profit for themselves by the difference between the contract prices and the wages they pay their assistants. The object of the sub-contractor or sweater being to secure as large a margin of profit as possible, the tendency of the system is to grind the workers down to the lowest possible limit. Laws have recently been enacted both in England and the United States to regulate the system, and providing penalties for the employment of children and others in over-crowded and ill-ventilated "sweat shops."

Sweden (Swedish, Sverige), a kingdom of Northern Europe comprising with Norway and Lapland the whole of the Scandina-

Sweden

vian peninsula, of which it forms the E., S., and most important portion; having N. E. Russian Finland; E. and S. the Gulf of Bothnia and the Baltic; S. W. the Sound, Cattegat, and Skager Rack; and W. and N. Norway, from which it is for the most part divided by the great mountain chain of Scandinavia. Length, N. to S., 950 miles; average breadth, about 190 miles; area, 172,876 square miles; pop. (1909) 5,429,600. Capital, Stockholm.

Topography.—Sweden comprises three principal regions: Gothland in the S.; Svealand, or Sweden proper, occupying the middle; and Norrland (by far the largest part), including the remainder. These three regions are divided for administrative purposes into 24 läns, or provinces. Sweden is mountainous in the W., but in general the country is comparatively level. Along the road from Gottenburg in the W. to Stockholm in the E. there is not a single acclivity of consequence till within a few miles of the latter.

Climate.—The climate is less severe than might be expected in so high a latitude. In Stockholm the average temperature throughout the year is four degrees higher than at St. Petersburg. The summers are hot, and spring is almost unknown. In the N. snow covers the ground for five or six months in the year. The W. coasts are milder and more humid than the E.

Rivers.—The rivers are numerous. The principal are the Dal and the Klar, rising in the mountains bordering on Norway, the Dal flowing into the Gulf of Bothnia, the Klar into Lake Wener. The Angerman, the Umea, the Skelleftea, the Pitea, the Lulea, and the Tornea are in the N. part.

Lakes.—Nearly one-eighth of the country is covered with lakes. The largest are the Wener, Wetter, and the Mälar, all in the S. provinces. In point of size Wener is the third lake in Europe.

Forests.—Sweden has extensive forests, more than two-fifths of the country being under timber. The principal trees are fir, pine, alder, birch, and, in the S. parts, oak, elm, and beech.

Fauna.—The chief domestic animals include horses, cattle, sheep, hogs, etc. Other animals are the hare, fox, beaver, wolf, lynx, and lemming. In the N. the reindeer is domesticated, but the wild reindeer is practically extinct. Fish in Swedish waters are far less abundant than in those of Norway. Waterfowl are numerous.

Agriculture.—The agricultural industry is being gradually improved, and about three-fourths of the population support themselves by it. In 1907 about 9 per cent. of the land was under cultivation. Apple, pear, and cherry trees grow but languidly; while berries of many kinds are produced spontaneously and spread luxuriantly. Wheat succeeds only in the S. provinces; oats are raised more generally and in larger quantities; but rye and barley are the kinds of grain most frequently met with.

Mineralogy.—The minerals are abundant, comprising iron, copper, lead, coal, porphyry, some silver, and marble. Swedish iron is of superior quality and its quantity is immense.

Manufactures.—The manufactures are largely articles of domestic use. They consist of lumber products, woolens, cottons, wood-pulp paper, linens, sugar, tobacco, etc. Tanning is carried on to some extent, and distilling, brewing, and shipbuilding are followed. The output of pottery, glass, woolens, sugar, snuff, and tobacco is scarcely sufficient to meet the home consumption. In 1905 the imports amounted to $153,780,000; the exports to $120,657,000.

Education.—Education is general. The University of Upsala was founded in 1477, and has maintained a good character, particularly for physical science. The University of Lund was founded in 1668. In the autumn of 1905 the former had 1,729 students, the latter 817. There are many high schools, normal, technical, and professional schools, and the scientific and literary societies of Sweden are numerous, especially in Stockholm. Public elementary education is gratuitous and compulsory, and the percentage of illiteracy in Sweden is very low.

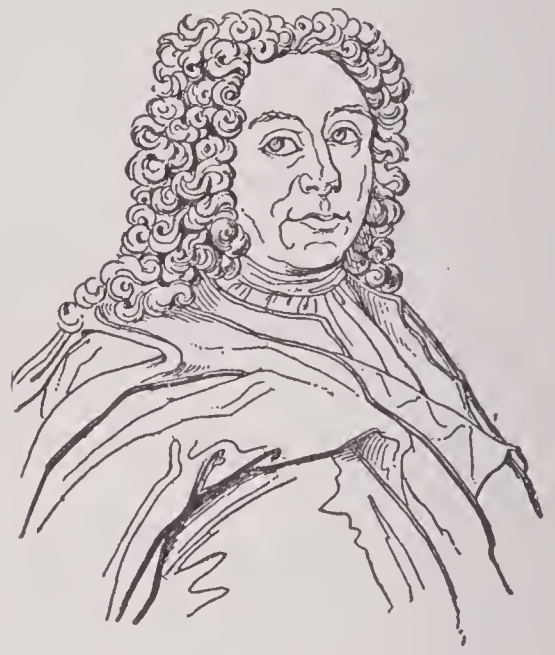
Religion.—Lutheranism is the religion of the state, and of nearly all the inhabitants, but other faiths are freely tolerated.

Government.—Sweden is a constitutional monarchy. The king must be a member of the Lutheran Church. His person is inviolable. He has the right to declare war and make peace upon the advice of the Council of State. He nominates to all higher appointments, both military and civil; concludes foreign treaties, and has a right to preside in the Supreme Court. The king has a veto against decrees of the Diet, and legislative power in matters of political administration and police. In all other respects such power is exercised jointly by the Diet and the sovereign. The Diet consists of two chambers, both elected by the people. The First or Upper Chamber consists of 150 members, and the Second or Lower Chamber of 230 members. In 1901 reorganization of the army was begun upon a plan intended to be fully accomplished by 1914.

Finance.—The revenue and expenditure of the kingdom for 1906-07 were each about $66,396,000. The public liabilities, contracted entirely for railroads, were about $141,043,900. All loans are paid off gradually by means of sinking funds. The expenses for public instruction are largely paid by the parishes, by which also, and out of the revenue of landed estates of the church, the expenditure for the church is mainly defrayed.

History.—The two kingdoms, Gothland and Svealand, of which Sweden once consisted, were united in the thirteenth century by the failure of the royal line in the former. In 1397, by the treaty of Calmar, Sweden became formally subject to Margaret of Denmark, called the "Semiramis of the North," who united Denmark, Sweden, and Norway. Gustavus Vasa asserted the independence of Sweden, and ascended the throne in 1523. He bequeathed the crown to his posterity, who continued to reign, and in general with distinction; but most of them, and in particular Gustavus Adolphus, his daughter Christina, Charles XII., and Gustavus III., discovered a romantic spirit, approaching in the case of Charles XII. to a degree of infatuation. This dynasty ended in a prince (Gustavus IV.) who had all the eccentricity and hardly any of the talents of his predecessors. In 1809 he was deposed, his uncle, Charles XIII., succeeding him. In 1814 Norway was united to Sweden (see NORWAY). The next king was Charles XIV. John (see BERNADOTTE), crowned in 1818. His successor was Oscar I. (1844), who was followed by Charles XV. (1859). Oscar II. (*q. v.*) came to the throne in 1872. In his reign the union with Norway was dissolved (1905). On the death of Oscar II. (1907), his son, Gustavus V., succeeded him.

Swedenborg, Emanuel, founder of the Church of the New Jerusalem, and one of the most distinguished men of science of the 18th century; born in Stockholm, Sweden, Jan. 29, 1688. He was carefully educated under the care of his father, Bishop of Skara, in W. Gothland, in the principles of the Lutheran Church. He was remarkable for his religious susceptibility in his youth; and his parents said that angels spoke through him. After pursuing his studies and taking the degree of Ph. D. at Upsal, he went on his travels in 1710, and visited the universities of England, Holland, France, and Germany. On his return, he was appointed assessor extraordinary to the College of Mines, and in 1719 was ennobled, on which occasion his name was changed from Swedberg to Swedenborg. He had in the previous year achieved a great engineering feat, in the transport, over a mountain district, of several galleys and boats for service at the siege of Fredrickshall. In 1721, he again traveled to examine mines, etc. He continued his scientific studies with an ardor that placed him in the first rank of European philosophers, till the year 1743, when, as he himself affirms, a new era of his life commenced, and he was permitted to hold intercourse with the inhabitants of the invisible world. In 1747, he resigned his office in the mining college, retired from public life, and spending his time alternately in Sweden and in England, devoted himself to the publication of his theological works. These are in themselves sufficiently numerous to form a life's work, and present throughout evidences of the deepest religious feeling. The style of composition marks them as works of a master mind. They are filled with illustrations from the scientific and metaphysical lore of their author, and present, perhaps, as remarkable a combination of science and theology as is anywhere to be met with. Though it is frequently affirmed that Swedenborg labored under a delusion, his writings show no symptoms of aberration; the last, finished but a few months before his death, being singularly clear, logical, and free from enthusiasm. He was always regarded as a learned and pious man; and it



EMANUEL SWEDENBORG.

would appear that the story of his insanity rests for its support on the word of a single enemy. He was never married; and his habits and mode of life were remarkable for their simplicity. The believers in his doctrines are now become a numerous body (see SWEDENBORGIANS). Of his very numerous works, it is impossible to name more than a few of the most important. In science, the "Dædaperboreus" (1716–1718); "Philosophical and Mineralogical Works" (1734); "Œconomia Regni Animalis" (Economy of the Animal Kingdom; and "Regnum Animale" (The Animal Kingdom); in theology, the "Arcana Cœlestia" (The Secrets of Heaven), "Apocalypsis Revelata" (The Apocalypse Revealed), "De Cultu et Amore Dei" (On the Worship and Love of God), "On Heaven and Hell," "On Conjugal Love," and the "True Christian Religion." He died in London, England, March 29, 1772.

Swedenborgians. See NEW JERUSALEM, CHURCH OF THE.

Swedish Beamtree, in botany, the *Pyrus intermedia*, a sub-species of *P. aria*. It

has oblong, rather distinctly-lobed leaves, ashy-white below, with five to eight nerves on each side.

Swedish Turnip, a kind of turnip, *Brassica campestris rutabaga*, introduced originally from Sweden. The bulb is elongated, the leaves glaucous, the inside either white or, more generally, yellow, the quality not being affected by the variation of color. It is very hardy, not generally suffering injury from intense cold.

Sweeny, Thomas William, an American military officer; born in Cork, Ireland, Dec. 25, 1820; settled in the United States in 1832 and learned the printer's trade. In 1846 he was made 2d lieutenant in the 1st New York Volunteers; took part in the bombardment of Vera Cruz and in the assault on Churubusco, where he greatly distinguished himself, but his right arm was so severely wounded in the latter action that it had to be amputated. After the Mexican War he was commissioned 2d lieutenant in the 2d United States Infantry, and was on duty in California and at other posts in the West, where he was often engaged against the hostile Indians. In January, 1861, he was promoted captain and assigned to the command of the arsenal in St. Louis, where over 40 tons of powder and all sorts of equipments sufficient to arm 60,000 troops were stored. In his command were only 40 recruits, while there were nearly 3,000 hostile minute men in St. Louis. Inducements were made to him to surrender the arsenal, but he kept all enemies at bay by the threat that if any violence were attempted he would blow the place to atoms. He became a Brigadier-General of volunteers in May, 1861, and later colonel of the 52d Illinois Volunteers, with which regiment he took part in the capture of Fort Donelson. After this he was assigned the care of 6,000 prisoners whom he took to Alton, Ill. During the first day of the action at Shiloh he held the key of the Union position, concerning his defense of which General Sherman said: "I attach more importance to that event than to any of the hundred achievements which I have since heard saved the day." He was promoted major of the 16th United States Infantry in October, 1863. During the Atlanta campaign his command captured Snake Creek gap 24 hours before the cavalry came up, and checked every effort of the enemy to retake it. He also took part in the action at Dallas and Kenesaw Mountain; but won his greatest distinction on July 22, 1864, in the engagement before Atlanta. He there routed the enemy with great slaughter, took 900 prisoners, and four battle flags. He was retired in May, 1870, with the rank of Brigadier-General U. S. A. He died in Astoria, L. I., April 10, 1892.

Sweepstakes, a gaming transaction in which a number of persons join in contributing a certain stake, which becomes the property of one or several of the contributors on certain conditions. Thus, in a sweepstakes for horses starting in a race, the owner of the winner receives the whole stakes, or a portion of it, the remainder being divided between the second and third. Also, the prize in a horse race, etc., made up of contributions from several persons.

Sweet, Alexander Edwin, an American journalist; born in St. John, N. B., March 28, 1841. He served in the Confederate army in the Civil War; was editor of the San Antonio (Texas) "Herald," and of "Texas Siftings" from 1881. He published "Three Dozen Good Stories from Texas Siftings"; and with J. Amory Knox, "On a Mexican Mustang through Texas," etc. (1883). He died in San Antonio, Tex., May 20, 1901.

Sweet, Benjamin Jeffrey, an American military officer; born in Kirkland, N. Y., April 24, 1832; settled with his parents in Stockbridge, Wis., in 1838; attended Appleton College for a year, and later spent his leisure in the study of law. In 1848 he became a member of the Wisconsin Legislature. At the outbreak of the Civil War he recruited the 21st and 22d Wisconsin regiments, becoming colonel of the former. During the battle of Perryville his regiment formed a part of a corps that through an entire day sustained an attack from the whole army of General Bragg, with the result that it lost 300 in killed and wounded. Though sick with malaria when the battle began, Colonel Sweet took command of his regiment. During the engagement he received a severe wound which permanently broke his health. Early in 1864 he was placed in command of Camp Douglas, Chicago, where about 10,000 Confederates were imprisoned. In June he learned of a scheme by which the prisoners expected to effect their escape on July 4, and afterward to burn the city. He immediately reënforced the garrison and thus killed the plot. In the following November he discovered another plot by which the camp was to be assaulted on election night, three days later. It was said that at the time there were 5,000 armed men in the city ready to attack the post and to arm the 9,000 prisoners, who were then to burn Chicago, the flames of which would be a signal for the uprising of 500,000 men in the surrounding country. Colonel Sweet had but 796 men in the garrison and it was too late to secure reënforcements. He thereupon summoned to his aid John T. Shanks, a Texas ranger, who was a prisoner and knew the Confederate officers, and arranged with him to discover the guilty parties. Shanks was constantly under the surveillance of detec-

tives, who were ordered to kill him on the first sign of any treachery. So well, however, did he perform his task that the leaders of the plot were all apprehended in less than 36 hours. In recognition of this service he was promoted Brigadier-General of volunteers. In January, 1872, he was made 1st Deputy Commissioner of Internal Revenue and removed to Washington, D. C., where he died Jan. 1, 1874.

Sweet Briar, or **Sweet Brier** (*Rosa rubiginosa*), naturalized in the United States, and grows wild, but is often planted in hedges and gardens on account of the sweet balsamic smell of its small leaves and flowers. It is also called the eglantine.

Sweet Chestnut, the *Castanea vesca* or *vulgaris*, a tree with oblong, lanceolate, acuminate, muerono-serrate, glabrous leaves, and clusters of minute, pale greenish-yellow, unisexual, apetalous flowers in spikes. The fruit is a prickly cupule, husk, or involucre, with one or more nuts, each with one large seed. It grows wild in America and in the S. of Europe. On the slopes of Etna, where there are forests of it, there grow some old trees with trunks of enormous girth. The chestnuts of commeree are derived chiefly from the cultivated varieties of the tree, and are larger and sweeter than the wild fruit. The nuts are consumed as an article of daily food in the S. of Europe, and in parts of France are served up for breakfast, boiled in milk. Many houses in the older parts of London are said by Evelyn to have been built of its timber, which has the character of keeping off insects, spiders, etc. It is good for mill and water works, besides affording excellent stakes for palisades, and props for vines and hops. The timber is extensively used in America, especially for the inside finishing of houses, furniture, etc. Called also the Spanish chestnut.

Sweetflag (*Acorus Calamus*), a plant, also called sweetrush, found in marshy places throughout the Northern Hemisphere. The leaves are all radical, long, and sword-shaped; the stem bears a lateral, dense, greenish spike of flowers; the root is long, cylindrical, and knotted. The root has a strong aromatic odor, and a warm, pungent, bitterish taste, and has been employed in medicine since the time of Hippocrates. It is also used by confectioners as a candy, and by perfumers in the preparation of aromatic vinegar, hair powder, etc.

Sweet Gum, the *Liquidambar styraciflua*, a North American tree about 60 feet high with apetalous flowers, in appearance like *Acer campestre*. The wood is fine-grained, and well adapted for furniture; the fragrant gum exuding from it when incisions are made in its bark constitutes liquidambar.

Sweet Pea (*Lathyrus odoratus*), a familiar garden annual plant belonging to the natural order *Leguminosæ*. It is a native of Sicily and other parts of the S. of Europe, and has been cultivated for its beautiful and fragrant flowers in American gardens for about 100 years. The varieties are very numerous, distinguished chiefly by the different shades of color of the flowers. It is cultivated as a hardy annual, and is so hardy that it may be sown in autumn and will not only withstand the cold of winter in all but the coldest districts, but will bloom earlier and better than when sown only in spring. Sowing in the latter season is, however, necessary to provide prolongation of bloom. Other species of *Lathyrus* are of interest either as ornamental plants or for the food for man or cattle which they yield. The everlasting pea (*L. latifolius*) is an old favorite in flower gardens on account of its handsome but scentless flowers. The roots of *L. tuberosus* are eaten in Holland and other countries where it grows plentifully. The chickling vetch (*L. sativus*) is much used in Switzerland as fodder for cattle. The seeds ground into meal make palatable bread, but to its use was ascribed sudden attacks of loss of power and rigidity of the limbs in both men and the lower animals, which were so prevalent in the latter part of the 17th and early in the 18th century that an edict was issued forbidding its use. Mixed with half the quantity of wheat flower it is said to be wholesome; the peasantry in Italy use it in this way.

Sweet Potato (*Batatas*), a genus of plants belonging to the natural order *Convolvulaceæ*. *B. edulis*, the true sweet potato, is a twining or climbing plant, with stems five or six feet long trailing on the ground or clambering over neighboring shrubs. The leaves are five or six inches long, heart-shaped at the base; the flowers pale purple, closely resembling those of the common convolvulus or bind-weed. Having been long cultivated in the tropical and subtropical countries of both hemispheres, the native country of the plant is a matter of conjecture. It appears to be first mentioned by Pigafetta, an author of the 16th century, who found the root much used by the Indians of Brazil as an article of food. It was introduced into Spain about 1519, and the roots were known in England some time before the introduction of the potato, with which they were often confounded by the earlier writers on the latter. English supplies in those times were obtained from Spain and the Canary Islands, and the roots, when steeped in wine or made into sweetmeats, were regarded as restorative of failing vigor. The plant is cultivated in India, China, Japan, the Malayan Archipelago, throughout tropical America, and in the

Southern United States, in Southern Europe, the Canary Islands, Madeira, and North Africa. The roots grow to a great size — to as much as 50 pounds weight, according to some authorities, in Java, but the ordinary average is from 3 to 12 pounds. In favorable conditions in the United States the yield per acre is from 200 to 300 bushels. The taste of the roots is sweetish and agreeable, and they are considered to be superior to the common potato in flesh-forming matters. *B. jalapa*, a species of Mexico, though purgative, is not the source of the true jalap of the pharmacopœia, as its name implies, but is so called on account of its being very common in the vicinity of the Mexican town Jalapa. *B. paniculata*, which has a very wide geographic distribution, is commonly cultivated for food in W. tropical Africa. From the seeds of another species of Batatas the textile material named Natal cotton is obtained; it has some resemblance to the true cotton.

SWEET POTATO.

Sweet Singers, a name given to a small party in the Scotch Church who, in 1681, forsook their worldly business to devote themselves to a life of prayer and good works. They took their name from their habit of singing some of the more mournful Psalms. Called also Gibbites, from their leader, John Gib, a master-mariner, of Borrowstounnes, a seaport of Linlithgow. Also a name given to the English Ranters of the 17th century by some contemporary writers.

Sweet Sop, the *Anona squamosa*, a large shrub or tree of stunted irregular growth with spreading branches, indigenous in the West Indies and much cultivated in other tropical countries. It is completely domesticated over a great part of India. The fruit is about the size of an orange, of a glaucous yellowish-green color, covered with projecting scales; pulp white with a tinge of yellow, very sweet. The acrid seeds and the leaves are insecticide.

Sweet William, in botany and horticulture, *Dianthus barbatus* (Prior considers that William is a corruption of French *œillet* = a little eye). The leaves are lanceolate and nerved; the flowers are aggregated in bundles; the calycinal scales ovate, awl-shaped, as long as the tube; petals bearded, whence the book name of bearded pink. It may be single or double; the petals dark purple, red, speckled, or white. Also the *Silene armeria*, common, or Lobel's campion, a very common garden plant, with viscid stems, ovate lanceolate leaves, and forked corymbose panicles of pink flowers. It flowers in July and August.

Swell, in music, a gradual increase and decrease of sound; the crescendo and diminuendo combined, marked by the sign ⟨⟩. Also an arrangement in an organ (and in some harmoniums) whereby the player can increase or diminish the intensity of the sound at will. In the organ it consists of a series of pipes with a separate key board, and forming a separate department (called the swell organ). The loudness or softness of the tone is regulated by opening or shutting, by means of a pedal, a set of slats like a Venetian blind, which forms part of the frame in which the pipes are inclosed.

Swensson, Carl Aaron, an American educator; born in Sugar Grove, Pa., June 25, 1857; was graduated at Augustana College, Rock Island, Ill., in 1877, and at the Augustana Theological Seminary in 1879. Subsequently he was pastor of the Bethany Lutheran Church; secretary and later president of the General Council of the Lutheran Church of North America; member of the Kansas Legislature; and delegate-at-large to the Republican National Convention at St. Louis in 1896. He was the author and compiler of several hymn books, and editor and contributor to various Church and secular papers. He died in 1904.

Swetchine, Anne Sophie (svech-ēn′), a Russian writer; born in Moscow in 1782. At St. Petersburg her drawing-room was frequented by scholars and men of science; after 1815 she resided in Paris. She was the friend and correspondent of many of the Catholic notables of France — Joseph de Maistre, Lacordaire, De Falloux, etc. Her "Life and Works" was published in two volumes; and her "Letters" in several volumes. She died in Paris Sept. 10, 1857.

Swett, John, an American educator; born in Pittsfield, N. H., July 31, 1830; was educated at the Pembroke (N. H.) Academy; and subsequently engaged in teaching. He was State superintendent of education of California in 1863–1868; deputy superintendent of the San Francisco schools in 1870–1873; principal of the Girls'

High and Normal schools in 1876–1889; and city superintendent of the San Francisco schools in 1891–1894. Among his numerous publications are "History of the Public-School System of California"; "American Public Schools"; "School Elocution," etc. In 1895 he gave up teaching and turned his attention to farming and fruit growing.

Swett, Sophia Miriam, an American writer; born in Brewer, Me., in 186–. She published: "The Lollipops' Vacation"; "Captain Polly"; "Flying Hill Farm"; "The Mate of the Mary Ann"; "Cap'n Thistletop"; "The Ponkarty Braneh Road"; "The Boy from Beaver Hollow" (1900); etc.

Sweyn, a king of Denmark, father of Canute the Great. He died in 1014, after having established himself in England, though without being crowned there. See DENMARK and ETHELRED II.

Swietenia (named after Gerard Van Swieten, 1700–1772, physician to Maria Theresa of Austria), the mahogany tree; the typical genus of *Swieteneæ.* Calyx short, five-cleft; petals five, stamens united into a tube having at the tip 10 anthers; fruit, a capsule with five cells, and many winged seeds. Only known species *S. mahogani.* See MAHOGANY.

Swift, the *Hirundo apus* of Linnæus and *Cypselus apus* or *murarius* of modern ornithologists. Though swifts are like swallows

COMMON SWIFT.

in many respects, their structure is almost entirely different, and some naturalists rather class them with the humming birds or the goat suckers. The swift has all four toes directed forward; it is larger than the swallow; its flight is more rapid and steady; and its scream is very different from the twittering of the swallow. It has the greatest powers of flight of any bird that visits Great Britain. Its weight is most disproportionately small to its extent of wing, the former being scarcely an ounce, the latter 18 inches, the length of the body being about 8 inches. Its color is a somber or sooty black, a whitish patch appearing beneath the chin. It builds in holes in the roofs of houses, in towers, or in hollow trees. It leaves Great Britain in August, having arrived from Africa early in May. The *C. melba* or *alpinus,* a larger species with the lower parts dusky white, has its home in the mountainous parts of Central and Southern Europe. A common North American swift is the so-called chimney swallow (*Chætura pelagica*), which builds its nest in chimneys (see SWALLOW). The swifts or swiftlets of the genus *Collocalia,* which inhabit chiefly the islands of the Indian Ocean from the N. of Madagascar E., construct the edible birds'-nests which are used by Chinese epicures in the making of soup.

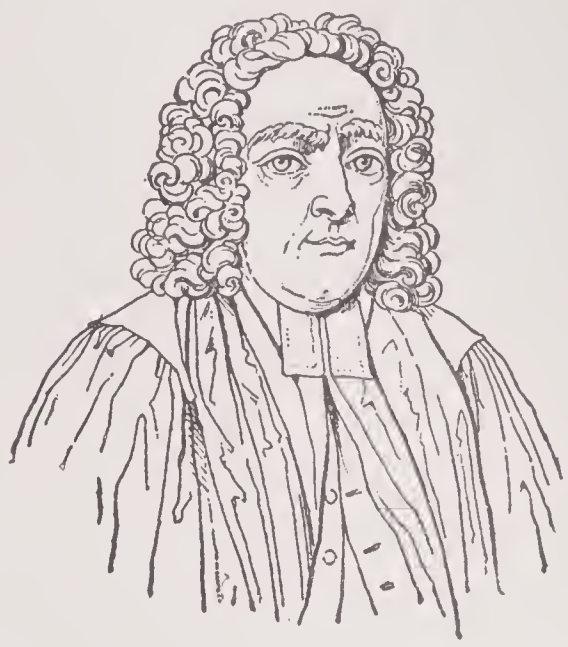
Swift, Jonathan, the greatest of English satirists; born in Dublin, Ireland, Nov. 30, 1667. He was the posthumous son of Jonathan Swift, an Englishman, steward of the Irish inns of court, and was educated at Kilkenny and at Trinity College, Dublin. In 1688 he crossed over to England to pay a visit to his mother, who was residing at Leicester, in her native county, in a state of dependence on her relations. By her advice he communicated his situation to Sir William Temple, who had married one of her relatives, and who at that time lived in retirement at Moor Park, Surrey. He was received by Sir William into his house as his amanuensis, and was introduced to King William who often visited Temple privately, and who offered Swift a captaincy of horse which he declined, having already decided for the Church. In July, 1692, he graduated as M. A. at Oxford, having entered at Hart Hall in the preceding May. In 1694 conceiving his patron to be neglectful of his interest, he parted from him, with some tokens of displeasure on both sides, and went to Ireland where he took orders; but he soon returned to Sir William Temple, and remained with him during the few remaining years of that statesman's life. On his death Swift found himself benefited by a pecuniary legacy and the bequest of his papers which he published with a dedication to the king.

In 1699 he accepted an invitation from the Earl of Berkeley, one of the lord-justices in Ireland, to accompany him as chaplain and secretary, and was presented by that nobleman with the living of Laracor, where he went to reside in 1700. During his residence there he invited to Ireland Miss Esther Johnson, the lady whom he has rendered

celebrated by the name of Stella, and with whom he had become acquainted in the house of Sir William Temple, her mother being a companion to Lady Gifford, the sister of Sir William. Miss Johnson, at this time about 19 years of age, was accompanied by a Mrs. Dingley; and the two ladies resided in the neighborhood when Swift was at home, and at the parsonage house during his absence. In 1701 he took his doctor's degree, and in 1704 he published anonymously his famous "Tale of a Tub," to which was appended the "Battle of the Books." In 1708 appeared, among other things, an attack on astrology under the title of "Predictions for the Year 1708, by Isaac Bickerstaff, Esq.," and in 1709 a "Project for the Advancement of Religion," dedicated to Lady Berkeley, the only work to which he ever put his name.

In 1710 he was in London, being engaged by the Irish prelacy to obtain a remission of the first-fruits and twentieths, payable by the Irish clergy to the crown, and was introduced to Harley, afterward Earl of Oxford, and to Secretary St. John, subsequently Lord Bolingbroke. He overtly joined the Tory party, and several political tracts appeared from his pen. The two most famous of these were "The Conduct of the Allies" (1711) and "The Barrier Treaty" (1712), which did immense service to the Tories, preparing the mind of the country for the peace which the ministers were then anxious to bring about. A bishopric in England was the object of his ambition, but the only preferment he obtained from his ministerial friends was the Irish deanery of St. Patrick's, to which he was presented in 1713. The dissensions between Oxford and Bolingbroke, whom he in vain attempted to reconcile, and the death of the queen which soon followed, put an end to his prospects and condemned him to unwilling residence for life in a country which he disliked.

In 1716 he is said to have been privately married to Miss Johnson; but this is doubted. In 1712 he had become acquainted in London with Miss Hester Vanhomrigh (Vanessa), a lady of fortune with a taste for literature, in which it was a pleasure to him to give her instruction. The pupil became enamored of her tutor and even proposed marriage to him; but he avoided a decisive answer. Miss Vamhomrigh died in 1723, of shock, it is said, at discovering his secret union with Stella. His "Proposal for the Universal Use of Irish Manufactures" (1720), and his celebrated "Drapier's Letters" (1723), made him the idol of the Irish people. His famous "Gulliver's Travels" appeared in 1726. After the death of Stella, which took place in 1728, his life became much retired, and the austerity of his temper increased. He continued, however, earnest in his exertions to better the condition of the wretched poor of Ireland; in addition to which he dedicated a third of his income to charity. Latterly the faculties of his mind decayed, and by 1742 had entirely given way. He died in Dublin Oct. 19, 1745, bequeathing the greatest part of his fortune to a hospital for lunatics and



JONATHAN SWIFT.

idiots. As a writer Swift has, perhaps, never been exceeded in grave irony, which he veils with an air of serious simplicity, admirably calculated to set it off. He abounds in ludicrous ideas, which often deviate, both in his poetry and prose, into very unpardonable grossness. His style forms a fine example of easy familiarity.

Swift, Lewis, an American astronomer; born in Clarkson, N. Y., Feb. 29, 1820; was graduated at Clarkson Academy in 1838, and spent the early part of his life in lecturing. Later he became interested in astronomy, built and set up his own telescope in Rochester, N. Y., and began to make observations. For years he searched the heavens for comets, and discovered the notable one of 1862. In 1869 he observed a total solar eclipse and secured valuable results. Two years later he found another comet, and in 1877–1879 discovered other comets, for which he was three times awarded the court prize and received a gold medal from the Imperial Academy of Sciences in Vienna. In 1882 he assumed the directorship of the Warner Observatory, and later took charge of the Lowe Observatory. He was the author of "Simple Lessons in Astronomy."

Swilly, Lough, a long narrow inlet of the Atlantic on the N. coast of Donegal, Ireland; enters between Dunaff Head on the E. and Fanad Point, on which there is a lighthouse (fixed light visible 14 miles), on the W. A second lighthouse, on Dunree Head, has a fixed light visible for 13 miles. The entrance is protected by forts. Lough Swilly penetrates about 25 miles inland, and has a width of 3 to 4 miles. On the E.

Swimming

shore is the small town of Buncrana, much resorted to for sea-bathing. On its waters a French fleet under Bompart was destroyed in 1798; and not many years later the British ship "Saldanha" foundered at the entrance in a storm.

Swimming, the art of propelling one's self through water by motions of the arms and legs; is a highly useful art and a gymnastic exercise of the first order. It is remarkable that swimming as a branch of physical education has hitherto been so largely neglected, and its utility ignored even by maritime communities. It is a well-known fact that among seafaring men the proportion of expert swimmers is exceedingly small. The sense has, however, been awakened of the need for a general cultivation of the art, and in most large cities swimming baths have been established where swimming may be practised and professional instruction obtained if desired. Moreover swimming has been introduced as a feature of physical training in some public schools. Keeping in view the fact that the human body has a less specific gravity than that of water, the art may be easily acquired with confidence and self-command, and attention to a few simple rules which are fully laid down in many cheap manuals. There are numerous mechanical aids to the teaching of swimming, in the form of cork floats, cork jackets, and many inflated india-rubber contrivances. In midsummer, 1875, Captain Boyton paddled himself, clad in a dress of the latter description, across the English Channel from Cape Grisnez to South Foreland; but the most wonderful swimming feat on record is that of Captain Webb, British Mercantile Marine, who in August, 1875, swam from Dover to Calais without artificial floats. The distance as the crow flies is 22½ miles, but owing to tides and currents the course traversed by Webb was at least 15 miles longer, and the time occupied was 21¾ hours. Two years later a similar feat was accomplished by Mr. Cavill in 12 hours, Cape Grisnez and South Foreland being the points of departure and landing.

Till April 7, 1886, a much disputed question was the length of time a person could remain under water. On the date given J. Finney, in a tank at the Canterbury Theater of Varieties, London, remained below the surface 4 minutes 29¼ seconds, which time will probably never be equaled, the nearest approach to it being 3 minutes 18¼ seconds on Sept. 27, 1889, by Miss Annie Johnson. Finney also swam 113 yards 1 foot in costume under water. This he did on Oct. 20, 1882, at Blackpool, in a bath 28 yards 1 foot long. The best plunge or standing dive, the body which has to be kept face downward having no progressive action imparted to it other than the impetus of the dive, stands to the credit of G. A. Blake, who on Oct. 10, 1888, at Lambeth Baths, did 75 feet 7 inches. Among other remarkable performances may be mentioned those of T. Burns who dived from Runcorn Bridge (85 feet) in October, 1889, and then swam to Liverpool, from whence he walked to London and dived off London Bridge; and J. Finney, who, at Manchester, on April 30, 1890, with his mouth picked up 75 coins from the bottom of a tank, his hands being tied behind his back.

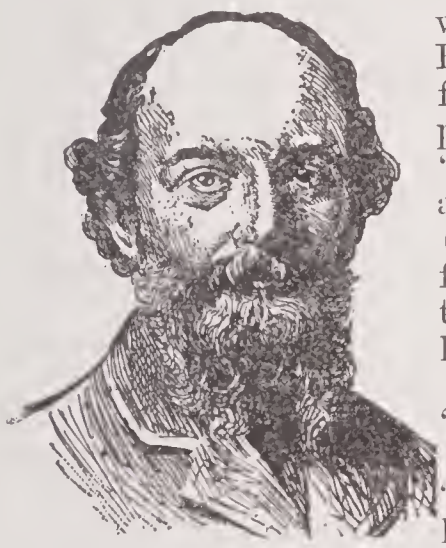
The following is a list of the best swimming performances on record:

Distance.	Amateur Records. Made in Baths. Holder.	Time.	Made in Open Water. Holder.	Time.	Professional Records. *Open Water. Others made in baths. Holder.	Time.
		H.M.S.		M.S.		M.S.
25 yards	H. A. Widemann (A.)	12 4-5	W. C. Johnson (A.)	14 4-5	.....	.....
40 yards	W. Evans (E.).....	22 1-5	.....	....	.....	....
50 yards	J. H. Derbyshire (E.)	26 2-5	W. B. Izard (A.)..	31 4-5	J. Haggerty..	24
60 yards	E. C. Schaefer (A.).	37	.....	....	.....	....
75 yards	H. A. Widemann (A.)	42	W. C. Johnson (A.)	52 4-5	.....	....
80 yards	E. C. Schaefer (A.).	51 2-5	.....	....	J. Haggerty..	51
100 yards	J. H. Derbyshire (E.)	1 00	E. C. Schaefer (A.)	1 05 3-5	S. Cavill.....	1 02¾
120 yards	J. H. Derbyshire (E.)	1 16 2-5	.....	....	J. Nutall.....	1 18 2-5
150 yards	J. H. Derbyshire (E.)	1 38 4-5	A. T. Kenny (A.)..	2 11 2-5	J. Nutall.....	1 41 2-5
200 yards	J. H. Tyers (E.)....	2 20	.....	....	J. Nutall.....	2 21
220 yards	F. C. Lane (Aus.). / J H. Derbyshire (E)	2 38 1-5 / 2 38 1-5	E. C. Schaefer (A.)	2 50 4-5	J. Nutall.....	2 37
300 yards	J. H. Derbyshire (E.)	3 37 2-5	.....	....	.....	....
400 yards	J. A. Jarvis (E.)....	5 13 1-5	.....	....	.....	....
440 yards	J. A. Jarvis (E.)....	5 45 2-5	E. C. Schaefer (A.)	6 26	J. Nutall.....	5 51
500 yards	J. A. Jarvis (E.)....	6 34	.....	....	J. Nutall.....	6 38¼
600 yards	J. A. Jarvis (E.)....	8 03	.....	....	.....	....
660 yards	.....	.....	J. A. Jarvis (E.)..	9 16	.....	....
880 yards	J. A. Jarvis (E.)....	12 17	P. Cavill (Aus.)...	12 45 3-5	J. Nutall.....	12 13¾
1,000 yards	J. A. Jarvis (E.)....	13 43	J. A. Jarvis (E.)..	14 10	J. Nutall.....	13 54½
1 mile....	G. Read (Aus.).....	24 46 4-5	J. A. Jarvis (E.)..	25 13 2-5	J. Nutall *....	26 08
2 miles...	P. Neuman (A.)....	1 08 07½	.....	....	.....	....
3 miles....	P. Neuman (A.).....	1 45 49	.....	....	.....	....
4 miles....	P. Neuman (A.)....	2 22 29 3-5	.....	....	.....	....
5 miles....	P. Neuman (A.)....	2 58 00½	.....	....	.....	....

(A.) American. (Aus.) Australian. (E.) English.

Swimming Bladder, the swim bladder or air bladder of fishes; a hollow sac, formed of several tunics, containing gas, situated in the abdominal cavity, but outside the peritoneal sac, entirely closed or communicating by a duct with the intestinal tract. The special function of the swimming bladder is to alter the specific gravity of the fish, or to change the center of gravity. It is absent in the *Leptocardii, Cyclostomata, Chondropterygii,* and *Holocephala,* but occurs in all the *Ganoidei,* in one sub-order of which (*Dipnoi*) it possesses anatomical characters, and assumes, to some extent, the functions of a lung; in the genus *Ceratodus,* the swimming bladder, though a single cavity, has symmetrically arranged internal pouches, while in the other genera of the sub-order (*Lepidosiren* and *Protopterus*) it is laterally halved, is supplied with venous blood by a true pulmonary artery, and by its cellular structure closely approaches the lungs of a reptile.

Swinburne, Algernon Charles, an English poet and essayist, son of Admiral Charles Henry Swinburne; born in London, England, 1837; was educated at Balliol College, Oxford. His first productions were "Queen Mother" and "Rosamund" (1861). They were followed by two tragedies: "Atalanta in Calydon" (1864), and "Chastelard" (1865), and by "Poems and Ballads" (1866), reprinted as "Laus Veneris"; "A Song of Italy" (1867); "William Blake," a critical essay (1867); "Ode on the Proclamation of the French Republic, Sept. 4, 1870"; "Songs of Sunrise" (1871); "Bothwell," a tragedy (1874); "Notes on Charlotte Brontë" (1877); "Mary Stuart: a Tragedy" (1881); "Tristram of Lyonesse" (1882); "A Century of Roundels" (1883); "Marino Faliero: a Tragedy" (1885); "A Study of Victor Hugo" (1886); a collection of essays and criticisms under the title of "Miscellanics" (1886); a poem on the "Armada" (1888); "A Study of Ben Jonson" (1890); "Astrophel, and Other Poems"; "Studies in Prose and Poetry" (1894); "The Tale of Balen" (1896); and "Rosamund, Queen of the Lombards." He died April 10, 1909.



ALGERNON SWINBURNE.

Swine Fever, a specific, contagious, and infectious fever, affecting the pig; associated with local disease of the lungs, the lymphatic glands, and the mucous membrane of the digestive canal, and caused by the growth and multiplication of a microscopic fungus in the blood. Its existence was first detected in England in 1862.

Swine Fish, a name given to the *Anarrhichas lupus* or sea wolf.

Swing, a cognomen assumed by senders of threatening letters during the period when the irritation of the agricultural laborers of England against their employers was at its height, namely from 1830 to 1833. The cause of this misunderstanding arose from a widespread belief on the part of the laborers that the use of machinery would greatly lessen the demand for labor, and consequently produce a general reduction of wages; it was also intensified by the savage severity with which the game laws were enforced, and by other hardships to which the laboring classes in the country considered themselves unjustly subjected. As disregard by landlords or farmers of the demands contained in these threatening letters was constantly followed by the burning of stacks and farm buildings, the employers of labor became so terrified that in very many cases almost implicit obedience was paid to the dictates of "Captain Swing."

Swing Bridge, a swivel bridge, spanning a canal or dock entrance, and opening horizontally to allow a vessel to pass. The swing bridge is balanced, and rotates in a horizontal plane. It is usually in two sections, each of which, when opened, is landed on its own side of the dock, the extended ends of the two meeting in the middle when brought into line, thus forming a bridge. See BRIDGE.

Swinton, John, an American journalist; born in Salton, Scotland, Dec. 12, 1830; early learned the printer's trade; came to Canada about 1853 and afterward to New York city; traveled extensively; took part in the Kansas "free State" contest; studied medicine; was chief of editorial staff of the "Times" from 1860 through the war; resigned post of managing editor, but continued his connection with the paper till Raymond's death in 1869; then with Horace Greely on the "Tribune" till about 1874; then chief of staff of the "Sun" till 1883, when he resigned to start "John Swinton's Paper," conducting it till 1887. In the spring of 1874 he became the active champion of workingmen; that fall was nominated with great enthusiasm by them for mayor of New York, but polled only 200 votes; took active part as public speaker, writer, and worker in all the movements of labor in New York after 1874. He wrote: "The New Issue" (1870); "Eulogy on Henry J. Raymond" (1870); "John Swinton's Travels" (1880); and an "Oration

on John Brown" (1881). He died in Brooklyn, N. Y., Dec. 15, 1901.

Swinton, William, an American educator, brother of John; born in Salton, Scotland, April 23, 1833. During the Civil War he was war correspondent of the New York "Times"; from 1869 to 1872 he was Professor of English Language and Literature in the University of California. After 1874 he devoted his time to the preparation of educational works. His writings include: "Rambles Among Words"; "Twelve Decisive Battles of the War"; "Campaigns of the Army of the Potomac"; "Word Analysis"; "Studies in English Literature"; and "Outlines of the World's History." He died in New York city Oct. 25, 1892.

Swiss Guards, a celebrated corps or regiment of Swiss mercenaries in the French army of the old régime, constituted as "Gardes" by royal decree in 1616. Mercenaries as they were, they were ever unswerving in their fidelity to the Bourbon kings, and their courage never blazed more brightly than on the steps of the Tuileries Aug. 10, 1792. They had been ordered to leave Paris by a decree of the Assembly on July 17, but had not yet been sent further than their barracks, when on Aug. 8, in anticipation of insurrection, they were ordered to march to the Tuileries. Michelet gives their number as 1,330; Challamel, Pollio, and Marcel in "Le Bataillon du Dix Août" (1881) as 1,200; Louis Blanc as 950; Mortimer-Ternaux as 900 to 950. But the number may now be taken definitely as nearly 800, including the ordinary guard of the king. In anticipation of a storm Mandat had made admirable arrangements to defend the palace, but the National Guards fraternized with the insurgents, and Mandat himself was murdered on the steps of the Hôtel de Ville, whither he had gone by the king's command on a summons from the municipality. Meanwhile a growing mob under Santerre, with the famous 500 men of Marseilles at their head, marched on the Tuileries. But before they reached the palace Roederer had persuaded the king to leave the Tuileries and place himself and the royal family under the protection of the National Assembly. He was accompanied thither by 150 Swiss, besides 200 gentlemen and about 100 National Guards. The remainder were left without orders, uncertain what to do, and when Westermann with his Marseilles and a raging mob made their way through the gates of the Tuileries and across the court the 650 Swiss under Captain Durler faced them on the great staircase, knowing only the orders of the night before that they were not to suffer themselves to be forced. Westermann, an Alsatian, tried to win them over by speaking to them in German, but it was not so that these men had learned duty. Some one fired a shot and the struggle began. The Swiss had already driven back Westermann with about 100 dead, when the king hearing the firing sent them orders to leave the palace. They fought their retreat across the gardens, while the mob swarmed into the palace and murdered a few wounded men they found there. Those under Durler made their way to the Assembly, were disarmed and placed in the neighboring church of the Feuillants; but those who were posted in the corridors and rooms of the palace did not hear the order to retreat, and were speedily attacked, overpowered by the mob, and hunted to death. A few fought their way out across the gardens only to find the drawbridge up, whereupon they made for the Place Louis XV., formed a square under the statue of the king, and were cut to pieces where they stood. Few but those who found refuge in the church of the Feuillants survived that fatal day. Fifty-four were sent to the Abbaye and were among the first to perish in the atrocious September massacres. The heroism of the Swiss guards was fittingly commemorated in 1821 by the great lion outside one of the gates of Lucerne, cut out of the rock after a model by Thorwaldsen.

Swisshelm, Jane Grey, an American reformer; born near Pittsburg, Pa., Sept. 6, 1815. She was among the earliest advocates of woman's rights; an ardent opponent of slavery, and while editing the St. Cloud (Minn.) "Visitor" had her office and press destroyed by a mob for advocating abolitionism. She was among the first to become a nurse in the Union army. Besides voluminous contributions to current periodicals, she published: "Letters to Country Girls" (1853), and an autobiography, "Half of a Century" (1881). She died in Swissvale, Pa., July 22, 1884.

Switchback, a term applied to a zigzagging, alternate back and forward mode of progression up a slope. A "switchback" railway originally meant one where the ascent is up a steep incline simplified by curving the track backwards and forwards (and upwards) on the face of the slope. Afterward the term came to be applied to a railway where (as at Mauch Chunk, Pa.) the movement of the cars is largely effected by their own weight alone, the descents by gravity and the ascents by a stationary engine. (This railway, once used for carrying coal, was superseded in this capacity by a tunnel, and subsequently reserved for pleasure excursions.) Hence the application to the well-known apparatus for amusing the public at watering places, fairs, and exhibitions: a short length of elevated railway with a series of rounded inclines, so that the car gains enough momentum descending the first steep incline to ascend one or more smaller inclines till it gradually

and more slowly works its way to the original level at the far end of the course. Thence it returns in the same way. Sometimes these switchbacks are made circular. Very similar were the so-called *Montagnes Russes*, elevated wooden frames with (wheeled) cars rushing down and up the slopes again, designed to represent Russian snow slides, which were introduced into Paris as a popular amusement about 1815. The "Flying Mountains" of St. Petersburg had been described by Lord Baltimore in his "Gaudia Poetica" (1770). Thomas Moore's "Epicurean," published in 1827, and based on some knowledge of the *Montagnes Russes*, describes very nearly the modern switchback. The latest form of this kind of amusement in the United States are known as the "toboggan," the "steeplechase," and "loop-the-loop."

Swithin, or **Swithun, St.,** Bishop of Winchester from 852 to 862. He was tutor to Egbert's son, Ethelwulf, under whom he was made bishop. He was a devoted builder of churches and a man of unusual piety and humility. He built a bridge at the E. side of the city. He died in 862 and was buried in the churchyard of Winchester, having asked, says William of Malmesbury, to be laid where "passers by might tread on his grave, and where the rain from the eaves might fall on it." A century later he was canonized, and the monks exhumed his body to deposit it in the cathedral; but this translation which was said to have taken place on July 15, is said, though unfortunately not by contemporary chroniclers, to have been delayed in consequence of violent rains. Hence the still current belief that if rain fall on July 15 it will continue to rain for 40 days.

Switzerland, a federal republic of Central Europe; bounded N. by Alsace-Lorraine and Baden, from which it is separated for the most part by the Rhine; N. E. by Würtemberg and Bavaria, from which it is separated by the Lake of Constance; E. by Austria and the principality of Lichtenstein, from which it is separated by the Rhine and the Grisons Alps; S. by Italy and France, from which it is separated by the Alps and the Lake of Geneva; and W. and N. W. by France, from which it is separated in part by the Jura Mountains, the Doubs river and Lake Geneva; greatest length 210 miles; greatest breadth 126 miles. It is composed of 22 cantons, three of which are divided into two parts with separate governments united successively for federal purposes from 1291 to 1815. The constitution of 1848, revised May 29, 1874, transformed the federation of States into a federal State. The largest cities are Geneva, Zürich, Basel, and Berne, the last being the federal capital; total area, 15,976 square miles; pop. (1908) 3,559,349.

Physical Features.— The characteristic physical features of Switzerland are its lofty mountain ranges, enormous glaciers, magnificent lakes, and romantic valleys. The loftiest mountain chains belong to the Alps, and are situated chiefly in the South. The central nucleus is Mount St. Gothard, which unites the principal watersheds of Europe, and sends its waters into four large basins, N. by the Rhine to the German Ocean, S. W. by the Rhone to the Mediterranean, S. E. by the Po to the Adriatic, and E. by the Danube to the Black Sea. In like manner it forms a kind of starting point for the loftiest ranges of the Alps — the Helvetian or Lepontine Alps to which it belongs itself; the Pennine Alps which include Mount Blanc, the culminating point of Europe, beyond the Swiss frontiers in Savoy; and the Rhaetian Alps which stretch E. and N. E. across the canton of Grisons into Tyrol. Besides the Alps, properly so called, the only range deserving of notice is that of the Jura, which is linked to the Alps by the small range, the Jorat.

Owing to the mountainous nature and the inland position of the country none of the rivers acquire such a size within its limits as to become of much navigable importance. The Rhine, formed by two head streams in the canton of Grisons, flows N. into the Lake of Constance, and thence W. to Schäffhausen, where it forms the celebrated falls of that name. Below these falls its navigation properly begins. Its principal affluent in Switzerland is the Aar. The Rhone, rising in the Rhone glacier (Valais), flows N. W. into the Lake of Geneva. Immediately after issuing from the lake at the town of Geneva it receives the Arve, and about 10 miles below leaves the Swiss frontier. The waters which the Po receives from Switzerland are carried to it by the Ticino; those which the Danube receives are carried to it by the Inn. The largest lakes, that of Geneva in the S. W. and of Constance in the N. E., as well as that of Maggiore on the S. side of the Alps, belong partly to other countries; but within the limits of Switzerland, and not far from its center, are Lake Neuchatel, with Morat and Bienne in its vicinity, Thun, with its feeder, Brienz, Lucerne or Vierwaldstatter see, Sempach, Baldegg, Zug, Zürich, and Wallenstatter see. All these internal lakes belong to the basin of the Rhine.

Geology and Minerals.— All the loftiest Alpine ranges have a nucleus of granite, on which gneiss and mica-slate recline generally at a high angle. Coal-bearing strata are found in the cantons of Valais, Vaud, Freiburg, Bern, and Thurgau, and brown coal is obtained in St. Gall and Zürich. Iron is worked to advantage in several quarters, particularly among the strata connected with the Jura limestone. Rock and com-

Switzerland

mon salt are produced to some extent in the cantons of Vaud, Basel, and Aargau. The only other minerals deserving of notice are alabaster and marble, widely diffused, and asphalt, in the Val-de-Travers, in the canton of Valais. Mineral springs occur in many quarters.

Climate and Agriculture.— Owing to differences of elevation the climate is extremely variable even in the same localities. Owing to the same cause, few countries in Europe even of larger extent can boast of a more varied vegetation than Switzerland. In regard to vegetation it has been divided into seven regions. The characteristic product of the first is the vine, which grows up to 1,700 or 1,800 feet above the sea-level. The next is the hilly or lower mountain region, rising to the height of 2,800 feet, and characterized by the luxuriance of its walnut trees, with good crops of spelt and excellent meadows. The third or upper mountain region which has its limit at 4,000 feet, produces forest timber, more especially beech, and has good crops of barley and oats, and excellent pastures. Above this, and up to the height of 5,500 feet, is the fourth or subalpine region, distinguished by its pine forests and maples; here no regular crops are grown. The fifth or lower alpine region, terminating at 6,500 feet, is the proper region of alpine pastures. In the sixth or upper alpine region the vegetation becomes more and more stunted, and the variation of the seasons is lost. The seventh or last region is that of perpetual snow. Many parts even of the lower regions of Switzerland are of a stony, sterile nature, but on every side the effects of persevering industry are apparent, and no spot that can be turned to good account is left unoccupied. Of the total area, 28.4 per cent. is unproductive; of the productive area nearly 35.8 per cent. is under grass and meadows; 29 per cent. under forest; 18.7 per cent. under fruit; and 16.4 per cent. under crops and gardens. The chief crops are wheat, spelt, rye, oats, and potatoes. The wine produced is generally good. Considerable quantities of fruits are grown. Among domestic animals the first place belongs to the horned cattle, and the dairy products of Switzerland are of most commercial importance, in 1900 cheese alone being exported to the value of $9,863,200, of which $906,976 was sent to the United States. On the higher grounds goats are very numerous. Another national industry which of late years has developed to an extraordinary degree is that of condensed milk, the exports of which amount yearly to $5,400,000. Among wild animals are bears, wolves, chamois, wild boars, stags, badgers, foxes, hares, otters, birds of prey of large dimensions, and many varieties of winged game. The lakes and rivers are well supplied with fish.

Manufactures.— Of the population about 40 per cent. are dependent on agriculture, and about 34 per cent. on the manufacturing industry. Switzerland is thus mainly an agricultural and manufacturing country. The system of peasant proprietorship prevails largely, it being estimated that there are nearly 300,000 peasant proprietors. The principal manufactures are cotton, silk, embroidery, watches and jewelry, machinery and iron, tobacco and wool. Geneva is the chief seat of the watch industry, Basel of the silk industry, and St. Gallen of embroidery.

Commerce.— Switzerland being an inland country, has direct commercial intercourse only with the surrounding States; but the trade with other countries, especially Great Britain, Germany, and the United States, is very important. In 1900 imports for home consumption amounted to $174,000,000; exports, $231,000,000. In 1898 there were 2,316 miles of railway. There is a very complete system of telegraphs, over 13,700 miles of wire being in operation in 1900. The French metric system of money, weights and measures has been generally adopted in Switzerland.

Religion and Education.— According to the constitution of 1874 there is absolute liberty of conscience and of creed. About 59 per cent. of the inhabitants belong to the Protestant Church, and about 41 per cent. to the Roman Catholic Church. Primary education is secular and compulsory throughout the confederation. In 1897 there were 718 infant schools; 4,413 primary schools; and about 600 secondary schools. For the higher education there are four universities, Basel, Zürich, Geneva, and Bern; the first founded in 1460, and the three others since 1832. There are also academies or incomplete universities at Lausanne and Neuchatel; a polytechnic school at Zürich; and a military academy at Thun.

Government and Finance.— The cantons of Switzerland are united together as a federal republic for mutual defense, but retain their individual independence in regard to all matters of internal administration. The legislative power of the confederation belongs to a federal assembly, and the executive power to a federal council. The Federal Assembly is composed of two divisions, the National Council and the Council of States. The National Council is elected every three years by the cantons — one member to each 20,000. Every lay Swiss citizen is eligible. The Council of States consists of 44 members — two for each canton. In addition to its legislative functions the Federal Assembly possesses the exclusive right of concluding treaties of alliance with other countries, declaring war and signing peace, sanctioning the cantonal constitutions, and taking measures regarding neutrality and intervention. The Fed-

eral Council consists of seven members elected for three years by the Federal Assembly, every citizen who has a vote for the National Council being eligible for becoming a member of the Federal Council. The seven members of the Federal Council act as chiefs of the seven administrative departments of the republic. The president and vice-president of the Federal Council are the chief magistrates of the republic. They are elected by the Federal Assembly for one year, and are not eligible for reëlection till after the expiration of another year. The Federal Tribunal, consisting of 16 members and 9 substitutes elected for six years by the Federal Assembly, decides in the last instance in all matters in dispute between the cantons, or between the cantons and the confederation, and acts in general as a high court of appeal. It is divided into a civil and criminal court. In 1900 the national revenue was $20,206,743, and expenditure $20,551,567. The public debt on Jan. 1, 1902 amounted to $13,600,000. Each canton has a budget of its own. For defense, see *Armies of the World* under ARMY, and *Navies of the World* under NAVY.

People.—The Swiss are a mixed people in race and language. German, French, Italian, and a corrupt kind of Latin called Rhaetian or Roumansch, are spoken in different parts. German is spoken by the majority of inhabitants in 15 cantons, French in five, Italian in one (Ticino), and Roumansch in one (the Grisons). Of the total population 71.6 per cent. speak German, 21.8 per cent. French, 5.4 per cent. Italian, and 1.2 per cent. Roumansch. The Swiss, however, have lived so long in a state of confederation that, apart from these peculiarities of origin and language, they have acquired a decided national character, and may now be viewed as forming a single people.

History.—After the conquest of Helvetia by Julius Cæsar, the Romans founded in it several flourishing cities which were afterward destroyed by the barbarians. On the decline of the Roman empire it successively formed a part of the kingdom of Burgundy and the dominions of the Merovingian and Carlovingian kings; while the E. part of Switzerland became first subject to the Allemanni, and subsequently it was wholly included in the German empire under Conrad II. in 1037. The house of Hapsburg had, from an early period, the supremacy over all the E. part of Switzerland, and it preserved its ascendency till about 1307, when Uri, Schwyz, and Unterwalden entered into a confederacy for mutual aid against Austria, which compact was confirmed after the defeat of Leopold, Duke of Austria, at the battle of Morgarten in 1315. From 1332 to 1353, Lucerne, Zurich, Glarus, Zug, and Berne joined the confederation. Aargau was conquered from Austria in 1415; the abbey and town of St. Gall joined the other cantons in 1451–1454; Thurgau was annexed in 1460; Freiburg and Solothurn admitted in 1481; the Grisons in 1497; Basel and Schaffhausen in 1501; and Appenzell in 1513. About this time Ticino was conquered from the Milanese, and Vaud taken from Savoy by the Bernese in 1560. The remaining cantons were not finally united to the confederation till the time of Napoleon; and the compact, by which all were placed on a perfect equality, only dates from the peace of 1814. Following the political and religious troubles which culminated in the adoption of the liberal constitution of 1848, Neuchatel declared itself independent of the King of Prussia in his title of Prince Neuchatel. The canton was declared a republic, with a constitution similar to that of the other Swiss States. The king protested, but in vain, and in 1857 he finally relinquished his claim. In May, 1874, another revision of the constitution was adopted. It makes civil marriages compulsory, establishes complete liberty of creed, prohibits the appointment of new bishoprics except under federal approval, excludes Jesuits, forbids new convents, and authorizes the government to expel dangerous foreigners, etc. In 1891 the 600th anniversary of Swiss nationality was celebrated.

Swivel, a link of a chain which turns round on a pin or axis fixed to the next link; also applied to a cannon adjusted to turn on a pivot, or to run on concentric rails, so that it may be fired in any direction. Swivel joints assume many varieties of form adapted to special uses.

Sword, a weapon of offense consisting of a blade fitted into a hilt or handle, with a guard, the blade being formed to cut or to pierce, generally to do both. It is the most highly honored of all weapons, a symbol of military dignity and authority; and it is the instrument with which the monarch confers knightly honors. Its forms and modifications, and the names under which, in different shapes, it has been known in different lands and in successive ages, are beyond computation. It is sufficient to say that the general term includes weapons so di-

SWORDS.

1, 2, cutting weapons of Stone Age; 3, ancient Greek sword; 4, Roman; 5, Saxon; 6, Danish; 7, mediæval cutting and thrusting sword; 8, sword of sixteenth century; 9, sword of the Georgian era; 10, Victorian sword.

verse as the short cutting and piercing daggers and poignards and the ponderous two-handed swords of the 15th century. The blade may thus vary in length from a few inches to four feet and upward. It may be furnished with a cutting edge on one side only, or on both sides. It may be uniform in breadth throughout, with a truncated end, or it may taper from the hilt to a fine point. The blade, moreover, may have a piercing point alone, as in the rapier, and it may be curved throughout its entire length, as in the Oriental scimitar. The hilt, with its many forms of guard, grip, and pommel, similarly adds to the variations of the weapon.

The sword, of course, could not be a weapon of primitive man; but it is easy to trace its development from the forms of weapon in use in the stone and early bronze ages. The sword came into use only when men had attained considerable skill in casting and working bronze, and the ancient bronze swords, many of which have been found throughout Europe with two-edged blades measuring two feet in length, are well finished weapons. The early Greek sword was merely a strong two-edged knife; but about 400 B. C. its form was improved and its size doubled by Iphicrates. The *gladius* of the Romans was still of the same form — a straight two-edged blade, heavier and longer, however, than the Greek weapon.

During the early Middle Ages there does not appear to have been much development in the form of the sword in Europe. As shown by the Bayeux Tapestry and other contemporary illustrations, it continued to be a short cutting weapon, with a blade of uniform breadth bluntly pointed, and to give it balance it was channeled from the hilt for about two-thirds of its length. The cross guard, subsequently called the quillons, was short, projecting at right angles from the blade, but sometimes bent forward in the direction of the point. With the development of armor in warfare it became necessary to give much greater heaviness and strength to the sword; the blade was greatly lengthened and tapered from hilt to point, the guard and the hilt were also lengthened, and in this way the two-handed sword — the distinguishing arm of the 15th century — was evolved. In Scotland several of these ponderous weapons are preserved, and traditionally associated with the names of Wallace, Bruce, and other contemporary heroes; but such swords were really not in use at so early a period, and so late as 1567 Lindsay proposed to meet Bothwell in single combat at Carberry, armed with "the famous two-handed sword of Archibald Bell-the-Cat."

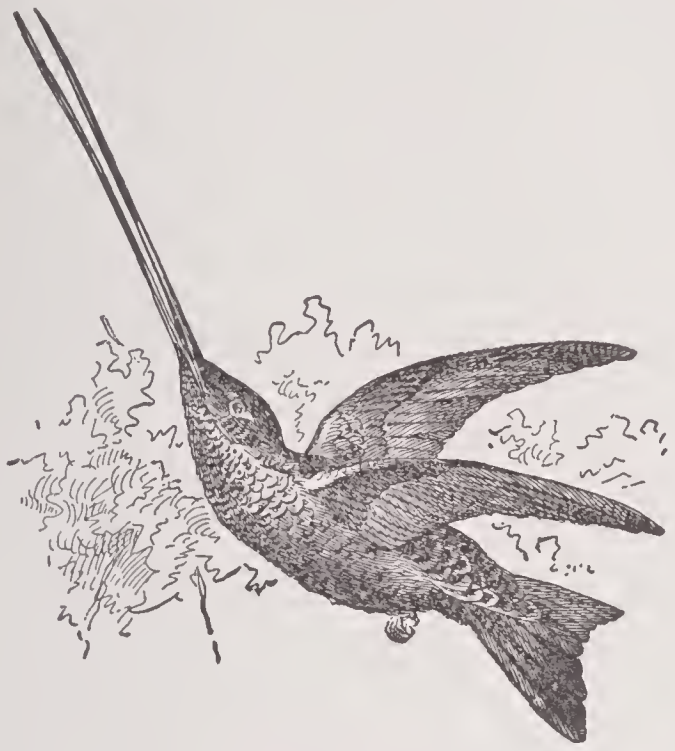
With the introduction of the two-handed sword, the use of a shield being no longer possible, the guard gradually became more complicated, so as to give greater protection to the hands of the swordsman, and from the use of shell guards and ring guards, etc., the basket hilt, as applied to lighter swords, by degrees developed. The ordinary basket hilt sword, such as is worn by officers of Highland regiments at the present day, is of Italian origin, and grew out of the Venetian *schiavone*. The rapier — a piercing weapon only, with a blade tapering to a fine point — came into use in the early part of the 16th century, and in the 17th century it became the weapon of fencing and dueling.

From very early times Toledo, Seville, and some other Spanish towns had a high reputation for the excellence of the swords made by their armorers, and when to their own skill was added the perfect craftsmanship of their Moorish conquerors the renown of Spanish blades became supreme. In the North Italian towns also, as well as at Solingen and Passau in Germany, swords of famous quality were fabricated. In Scotland during the 17th and 18th centuries Ferrara blades were held in the highest esteem, and were a very common possession. Who the original maker of these famous blades was is not known, but in the 16th century there was a family of armorers named Ferrara in North Italy, one member of which, called Andrea, was born in 1555. It is, however, obvious from the long period over which the manufacture extended that "Ferrara" became more a trade-mark than a maker's name. Many magnificently finished examples of swords from the Renaissance period downward are preserved as art treasures in public and private collections. On the enrichment of these the highest efforts of artificers and artists have been expended, and they have been lavishly adorned with gold enamels and precious stones. Additional interest is given to some of these swords by the legends attaching to them, and by the historical importance of the personages to whom they belonged. Mythical stories are also numerous of craftsmen endowed with marvelous powers and with whose blades unheard-of feats could be performed. In modern warfare the sword possesses little more than an honorary military significance.

Swordbill, a popular name for any individual of the humming bird genus, *Docimastes*. The bill which exceeds in length the body of the bird, is a character by which this humming bird may be distinguished at the first glance. Its use is to reach the insects on which the bird feeds at the bottom of long tubular flowers. One species is known, *D. ensiferus*, an inhabitant of Colombia, Ecuador, and Peru.

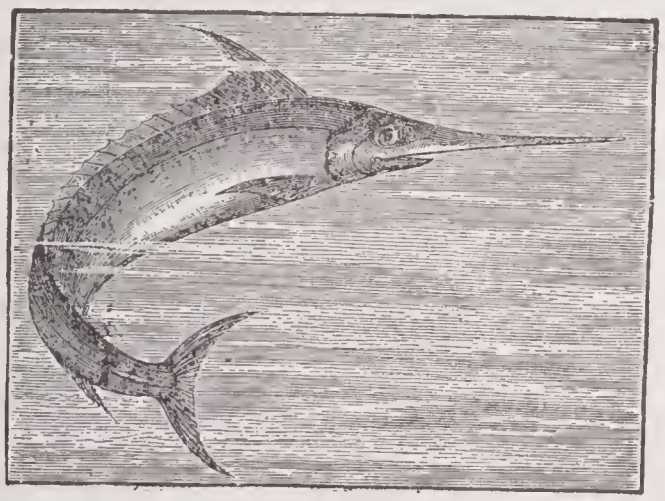
Swordfish, in astronomy, the constellation, Dorado. In ichthyology, a popular name for any individual of the *Xiphiidæ*.

They are pelagic fishes, widely distributed in tropical and sub-tropical seas, extremely strong and swift, so that the larger species are rarely captured, and more rarely preserved for examination and study. Their popular name is derived from their formid-



SWORDBILL.

able sword-like weapon, formed by the coalescence and prolongation of the maxillary and intermaxillary bones beyond the lower jaw; it is very hard and strong, and capable of inflicting terrible wounds. All the species undergo considerable change; young specimens differing widely from the adult in the general shape of the body, and in the production of the lower as well as the upper jaw. Swordfishes seem to have a mor-

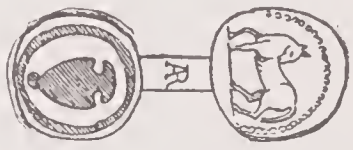


SWORDFISH.

tal antipathy to whales and other large *Cetaeea*, attacking them whenever occasion offers, and, so far as is known, always coming off victorious. In their fury swordfishes often attack boats and vessels, evidently mistaking them for cetaceans; and sometimes the sword has been driven through the bottom of a ship, and broken off by the fish in vain struggles to withdraw it. Swordfishes are the largest of the *Aeanthopterygii;* specimens of the genus *Histiophorus* (SAILORFISH, *q. v.*) from the Indian and Pacific Oceans, reaching a length of from 12 to 15 feet, of which the sword occupies rather more than three. The common or Mediterranean swordfish sometimes reaches a length of 10 feet, with a proportionately shorter sword; it is bluish-black above, merging into silver below. The tunny fishers often take these fish in their nets, and their flesh, especially when young, is said to be equal in flavor to that of the tunny.

Syagrus (named from Syagrus, who first wrote the history of the Trojan War in verse), in botany, a genus of unarmed *Coeoeæ*, closely akin to cocos itself. Flower spike enveloped in a double spathe; fruit like that of the cocoanut, but with a channel running from each of the three pores to the apex of the fruit. Known species five or six, chiefly from Brazil.

Sybaris, an ancient Greek city of Lower Italy, on the Gulf of Tarentum, supposed to have been built by a colony of Achæans and Trœzenians about 720 B. C. It rapidly rose to an extraordinary degree of prosperity, and the inhabitants were proverbial for their luxury and voluptuousness. It was totally destroyed by the Crotonians, who turned the waters of the river Crathis against it (510 B. C.).



COIN OF SYBARIS.

Sybel (sē′bl), **Heinrich von,** a German historian; born in Düsseldorf, Germany, Dec. 2, 1817; studied at Berlin under Ranke, and became professor at Bonn in 1844 and at Marburg in 1845. In 1861 he was elected by the university to the Prussian Landtag, and in 1874 was returned to the imperial Parliament. In 1878 he was nominated director of the state archives. Of his works the best known in England is his "History of the French Revolution." He died in Marburg, Germany, Aug. 1, 1895.

Sycamore, the *Aeer pseudo-platanus*, an umbrageous tree, 40 to 60 feet high; with spreading branches; large, five-lobed, coarsely and unequally serrate leaves, glaucous and downy on the veins beneath; pendulous racemes of greenish flowers, and glabrous fruit furnished with two long, membranous wings. It flowers in May and June. The wood is used for bowls, trenchers, and other turnery. The sap is sacchariferous. It grows wild in Switzerland, Germany, Austria, Italy, and Western Asia. It is a hardy tree, flourishing in spite of high winds or sea spray. When the leaves first appear (in April) they are covered with a clammy juice containing about one part in 11 of sugar, attractive to insects, by which they

are perforated and disfigured. The name is also applied to the plane tree or buttonwood of America, and the fig mulberry of Egypt and Syria (see SYCOMORE).

In entomology, a European night moth, *Acronycta accris*, so called because the caterpillar — which, when alarmed, rolls itself up like a millepede — feeds chiefly on the sycamore, though also on the horse chestnut and the oak.

Sycee, the fine silver of China cast into ingots, in shape resembling a native shoe, and weighing commonly more than a pound troy. These ingots are marked with the seal of the banker or assayer as a guarantee of their purity.

Sycoceryl Acetate, in chemistry, $C_{20}H_{32}O_2 = C_{18}H_{29}O \cdot C_2H_3O$; extracted from the resin of *Ficus rubiginosa* by treatment with boiling alcohol, or produced by heating sycoceryl alcohol with acetyl chloride. It crystallizes in thin prisms, insoluble in water, but soluble in chloroform and benzene.

Sycomore, a tree of the genus *Ficus*, the *F. Sycomorus*, or sycamore of Scripture, a kind of fig tree. It is very common in Palestine, Arabia, and Egypt, growing thick and to a great height, and though the grain is coarse, much used in building and very durable. Its wide-spreading branches afford a grateful shade in those hot climates, and its fruit which is produced in clusters on the trunk and the old limbs, is sweet and delicate.

Syconidæ, a family of calcareous sponges, widely distributed, with three subfamilies. They have regular, radially-disposed, cylindrical, ciliated chambers, opening direct into the sac-shaped gastric cavity. Sparsely represented in the Jurassic.

Syconinæ, a sub-family of *Syconidæ*, with seven genera. Radial tubes free for their whole length, or at least distally.

Syconus, a collective fruit, formed of an enlarged and more or less succulent receptacle, which bears a number of separate flowers. The fig is an example. The flowers are almost entirely inclosed by the enlarged, hollow, pear-shaped receptacle; and what are commonly called seeds are in reality one-seeded fruits resembling *Achænia*.

Sycoretin, an amorphous, white, neutral resin, obtained from the resin of *Ficus rubiginosa* by treatment with cold alcohol. It is very brittle and highly electric; is soluble in alcohol, ether, chloroform, and oil of turpentine, and melts in boiling water to a thick liquid, which floats on the surface.

Sycosis, a ringworm of the beard, produced by a fungal, *Microsporon mentagrophytes*, and aggravated by the use of alcoholic drinks. It most frequently affects the chin, sometimes spreading to other parts of the face; it is seldom seen on the scalp, and rarely affects women. Attention to cleanliness, the improvement of the general health, and especially the destruction of the parasite by sulphurous acid or by carbolic acid, are the proper remedies. Called also *Tinea sycosis* and mentagra.

Sydenham, a district in Lewisham parish, Kent, England, 8 miles S. of London. It has become of world-wide celebrity in connection with the Crystal Palace, which, however, is really in the adjoining parish of Lambeth, Surrey, and which was erected in 1852–1854, chiefly from the materials of the building of the Great Exhibition (1851), and under the superintendence of Sir Joseph Paxton. The cost of the erection and appointment of the Crystal Palace amounted to nearly $7,500,000. The building is 1,608 feet long, 390 wide across the transept, and 175 feet high, the height of the two water towers being 282 feet. The chief arts and sciences illustrated by the collections within the palace and grounds are sculpture, architecture, painting, and photography, mechanics and manufactures, botany, ethnology, palæontology, geology, and hydraulics. There are two concert rooms, within the larger of which on occasion of the triennial Handel festivals (since 1859) performances have taken place with 4,000 vocalists and instrumentalists. The park and gardens occupy nearly 200 acres, and are adorned with sculptures, stone balustrades, etc., and fountains which are perhaps the finest in the world. On Dec. 30, 1866, there was a fire in the N. wing doing damage to the amount of $750,000; and the Crystal Palace has never been a monetary success. In 1887 the company was declared insolvent, the total expenditure then having been $15,023,685, the receipts $22,049.845, and the number of visitors over 50,000,000.

Sydenham, Floyer, an accomplished man of letters, whose privations and miserable end brought about the foundation of the Literary Fund; was born in England in 1710; was graduated at Wadham College, Oxford (M. A., 1734), and in his 50th year began the publication, by subscription, of a complete English version of Plato's "Dialogues," each to be prefaced by a critical introduction and illustrated with explanatory notes. The "Io" appeared first, and was followed by the "Hippias Major" and "Minor" and the "Banquet." Superior in style and scholarship to the general run of 18th century translations, its merits found scant appreciation from a world not yet ripe for Plato's philosophy; subscribers were few, and the public were not tempted by the low price of the book to purchase or interest themselves in it. Undaunted by this failure, Sydenham made another attempt at arousing a taste for Greek philosophy by his

dissertation on Heraclitus (1775). This, too, had no market, any more than his publication entitled "Anomasticon Theologicum" (1784). Three years afterward he was arrested at the suit of a victualer for unpaid meals, and died in prison in 1787.

Sydenham, Thomas, the "sommo Ippocratista inglese" (supreme English Hippocratist), as Puccinotti styles him; born in Winford Eagle in Dorsetshire in 1624. That he belonged to one of the county families; that at 18 he was entered at Magdalen Hall, Oxford; that his studies were, after two years, interrupted by his having to serve as an officer in the parliamentarian army; that his Oxford curriculum ended in 1684 when he graduated M. B., and shortly after became a Fellow of All Souls — is the sum of our knowledge as to his youth and early manhood. For the next 15 years we lose sight of him, though he probably spent some of them at Oxford, if not also at Montpellier. We find him in London in 1663 as a licentiate of the College of Physicians, publishing his "Method of Curing Fevers" in 1666; and 10 years thereafter taking his M. D. at Pembroke Hall, Cambridge. With the College of Physicians, or even with Oxford, he seems to have had no subsequent connection, and all through his life he was not a person acceptable to the faculty. The "Iatro-physical" and "Chemiatric" theories in fashion at the time he treated with scant consideration, and looked on chemistry itself as a mere branch of the apothecary's business. But from his intimacy with John Locke and Robert Boyle we might infer his appreciation of the true philosopher and the true physicist, even if we did not know his profound mastery of the Hippocratic method and his perfect assimilation of the Hippocratic spirit. In 1668 he published a second edition of his book on fevers, adding to it a chapter on plague, with a fine poem in Latin elegiacs addressed to him by Locke. A third and enlarged edition, entitled "Medical Observations," appeared in 1676. In 1680 he published two "Letters in Response," the one "On Epidemics," and the other on the "Lues Venera." His "Epistolary Dissertation" on confluent smallpox and hysteria (1682) was followed next year by his yet more famous "Treatise on Podagra," in 1686 appeared his "On the New Fever," and in 1692 his last work, an outline of pathology and therapeutics. An acute attack of gout carried him off Dec. 29, 1689, and he was interred in St. James's Church, Piccadilly, where in 1810 the College of Physicians erected a mural tablet to his memory.

Sydenham's place in the history of medicine has already been given. Seemingly behind his age in science, he was really ahead of it in practice. The new-born anatomy and physiology had with premature confidence lent itself to theories, mathematical and chemical, which were utterly at variance with the phenomena of disease as noted at the bedside. He soon satisfied himself that it was hopeless to reconcile them, and that meanwhile, with practical sense, it was his business to get his patients well. In acute disease he read the forthputting of that activity by which nature sought to right herself — an activity to be watched and, when possible, to be assisted. Called in to a patient who had been deplorably reduced by lowering treatment, he reversed the practice and "ordered a roast chicken and a pint of canary." Chronic diseases he also viewed with the eye of Hippocrates, as due to habits or errors for which we ourselves are mainly responsible, and these he met by appropriate changes in diet and mode of life. The Hippocratic "natural history method" of looking at and treating ailments of all kinds it was his great merit to have intelligently revived. Among special contributions to nosology he may be said to have first diagnosed scarlatina and classified chorea, while Puccinotti claims for him the title of "restorer of the curative treatment of smallpox." Gout was another ailment on which he left a memorable mark. It was as a practitioner, however, that his powers worked most freely and most felicitously.

Sydney, the capital of New South Wales and the parent city of Australia, picturesquely situated on the S. shore of Port Jackson, the shore line being deeply indented by capacious bays or inlets which form harbors in themselves, and are lined with wharves, quays, and warehouses. Some of the older streets are narrow and crooked, bearing a striking resemblance to those of an English town; but the more modern streets, such as George street, Pitt street, Market street, King street, and Hunter street, rank high in order of architectural merit. The steam tramway system is extended to all parts of the suburbs, and water communication between the city and its transmarine suburbs, Balmain, North Shore, Manly Beach, etc., is maintained by numerous steam ferries. Among the most important public buildings are the new government offices, magnificent white freestone structures in the Italian style; the town hall, with a tower 200 feet high, and a very capacious great hall; the postoffice, an Italian building with a tower 250 feet high; the government house; the university, a Gothic building with a frontage of nearly 400 feet, situated in a fine park; the free public library; school of art; public museum; grammar school; St. Andrew's (Episcopal) Cathedral; St. Mary's (R. C.) Cathedral; the Jewish syna-

gogue; exchange; custom house; mint, parliament houses; hospitals, asylums, and numerous other ecclesiastical, scholastic, and business buildings, which would not suffer by comparison with the edifices of older countries.

The city is well lighted with gas, and the electric light is used at the leading quay, the postoffice, the railway terminus, and other places. The places of open-air recreation include the Domain, a beautiful park covering about 140 acres; Hyde Park, 40 acres, near the center of the city; the Botanical Gardens, the finest in the colonies, 38 acres; Moore Park, 600 acres; the Centennial Park, designed to commemorate the colony's centenary (1888), 768 acres; and the race course, 202 acres. The entrance from the Pacific Ocean to Port Jackson, about 4 miles N. E. of Sydney, is 1 mile in width, and is strongly fortified; the bay itself is about 10 miles in length and 3 in average breadth; it is well sheltered, and has a depth of water sufficient to float the largest vessels. Besides wharves and quays there are dry docks and other accommodation for shipping, and the trade of the port is very large. The principal exports are wool, tallow, hides, preserved meat, tin, copper, etc.; the imports, grain, tea, coffee, sugar, wine and spirits, ironware and machinery, cotton and woolen goods, wearing apparel, furniture, etc. Sydney was founded in 1788, and was named in honor of Viscount Sydney, the colonial secretary. It was incorporated in 1842. The discovery of gold in the colony in 1851 gave an immense impetus to its progress. Pop. (1901) with suburbs, 481,830.

Syenite, or **Sienite,** a name originally applied to the granite of Syene, which contains hornblende, but now generally restricted to a rock which consists of orthoclase, felspar and hornblende only; or where quartz is present only in sufficient quantity to be regarded as an accessory and not as an essential constituent. By the increase in the amount of quartz, and the presence of mica, syenite graduates into a hornblendic granite. Petrologists recognize as a typical syenite the rock of Meissen, near Dresden.

Syepoorite, a name given to a granular or minutely crystalline mineral employed by Indian jewelers to give a rose color to gold. Stated to have the composition: Sulphur, 35.2; cobalt, 64.8 = 100, which would yield the simple formula, CoS. Samples, however, of this mineral from the original locality appear to be cobaltine, so that the species is at present a doubtful one.

Syhedrite, a green mineral substance found in cavities in a porphyritic amygdaloidal dolerite, of uncertain composition, but supposed to be related to stilbite. Named by Shepard.

Sykes, George, an American military officer; born in Dover, Del., Oct. 9, 1822; was graduated at the United States Military Academy in 1842; was promoted 1st lieutenant Sept. 21, 1846; and during the war with Mexico took part at the actions of Monterey, Vera Cruz, Cerro Gordo, Contreras, Churubusco, and the siege and surrender of the City of Mexico. In May, 1861, he was promoted major of the 14th Infantry, and in September of the same year appointed Brigadier-General of volunteers. Later he won distinction at Gaines' Mills, and in the several subsequent operations of the Army of the Potomac; was promoted Major-General of volunteers in November, 1862; took part in the battles of Chancellorsville and commanded the 5th Army Corps during the battle of Gettysburg. At the close of the war he was brevetted Major-General U. S. A. for gallantry in service during the war. He was promoted colonel of the 20th United States Infantry in January, 1868. He died in Brownsville, Tex., Feb. 9, 1880, while in command of Fort Brown. His remains were removed to the West Point cemetery at the expense of Congress and a fine monument was erected to his memory.

Sylhet, or **Silhet** (Srihatta), a district in the extreme S. of Assam, British India; partly a rich alluvial tract, but to the extent of 32 per cent. uncultivable waste; has an area of 5,413 square miles and a pop. of 2,000,000. The chief town, Sylhet, on the Surmá river, has a pop. of about 15,000, and some trade and manufactures.

Syllabub, a culinary preparation, formerly much used, consisting of sugar and cream, flavored with brandy, sherry, and lemon rind and juice worked into a froth, and served in glasses. White of egg and verjuice seem also at times to have been ingredients.

Syllabus, in Church history, a list embracing the "chief errors and false doctrines of our most unhappy age," compiled by order of Pope Pius IX., and sent, with an encyclical letter, dated Dec. 8, 1864, "to all the bishops of the Catholic world, in order that these bishops may have before their eyes all the errors and pernicious doctrines which he had reprobated and condemned," the number of which amounts to 80, probably in imitation of the 80 heresies mentioned by Epiphanius as existing in the first three centuries. The syllabus is divided into 10 sections, and attacks rationalism, pantheism, latitudinarianism, socialism, errors concerning the Church, society, natural and Christian ethics, marriage, the power of the Pope, and modern liberalism.

Syllogism, in logic, an argument expressed in strict logical form, so that its conclusiveness is manifest from the struc-

ture of the expression alone, without any regard to the meaning of the terms. (Whately.) In a perfect syllogism there must be three, and not more than three propositions, the last of which, containing the matter to be proved, is called the conclusion; the other two, containing the means by which the conclusion is arrived at, are called the premises. The subject of the conclusion is called the minor term, and its predicate the major term; the third term, with which the minor and major terms are compared in the premises, is called the middle term. The premise which brings into relation the major and the middle terms is called the major premise, and that which brings the minor and middle term into a similar relation is called the minor premise. Thus, in the syllogism:

Major Premise. All A is B.
Minor Premise. All C is A.
Conclusion .·. All C is B.

B is the major, C the minor, and A the middle term. Substituting words for symbols,

Major Premise. All ruminants are quadrupeds.
Minor Premise. All deer are ruminants.
Conclusion .·. All deer are quadrupeds.

This syllogism is valid, because the conclusion logically follows from the premises. The conclusion is, moreover, true, because the premises from which it logically follows are true.

The figure of a syllogism consists in the situation of the middle term with respect to the major and minor. In the first figure the middle is the subject of the major and the predicate of the minor; in the second it is the predicate and in the third the subject of both premises; the fourth figure is the reverse of the first, the middle term being the predicate of the major and the subject of the minor. The symbolic names of these figures are commemorated in the following mnemonic hexameters:

1. BArbArA, CElArEnt, DArII, FErIOque prioris.
2. CEsArE, CAmEstrEs, FEstInO, BArOkO, secundæ.
3. Tertia DArApti, DIsAmIs, DAtIsI, FElAptOn, BOkArdO, FErIsOn, habet.
   Quarta insuper addit
4. BrAmAntIp, CAmEnEs, DImArIs, FEsApO, FrEsIsOn.

The mood of a syllogism depends on the quality (affirmative or negative) and quantity (universal or particular) of its propositions, which are marked thus:

Universal . . . A. Affirmative. E. Negative.
Particular . . . I. Affirmative. O. Negative.

Thus, the vowels of BArbArA denote three universal affirmative propositions; of CElArEnt, a universal negative, a universal affirmative, and a universal negative; and so on. A syllogism is said to be valid when the conclusion logically follows from the premises; if the conclusion does not so follow, the syllogism is invalid and constitutes a fallacy, if the error deceives the reasoner himself; but if it is advanced with the intention of deceiving others, it constitutes a sophism. The following rules for the construction of syllogisms are those given by Whately:

(1) Every syllogism has three, and only three, terms.
(2) Every syllogism has three, and only three, propositions.
(3) No term must be distributed in the conclusion which was not distributed in one of the premises.
(4) From negative premises nothing can be inferred.
(5) If one premise be negative the conclusion must be negative.

Sylphs, in the fantastic system of the Paracelsists, the elemental spirits of the air, just as the salamanders are of fire and the gnomes of earth. They hold an intermediate place between immaterial and material beings. They eat, drink, speak, move about, beget children, and are subject to infirmities like men; but, on the other hand, they resemble spirits in being more nimble and swift in their motions, while their bodies are more diaphanous than those of the human race. They also surpass the latter in their knowledge, both of the present and the future, but have no soul, and when they die nothing is left. In form they are ruder, taller, and stronger than men, but stand nearest to them of all the elemental spirits, in consequence of which they occasionally hold intercourse with human creatures, being especially fond of children and of simple harmless people; they even marry with our race, like the Undines and the Gnomes, and the children of such a union have souls and belong to the human race. In common usage the term sylph is applied to a graceful maiden — a change of meaning probably owing to the popularity of Pope's "Rape of the Lock," which introduced the term into the world of fashion and literature. For though even in Pope the sylph that guards Belinda is masculine, yet the poet so refined and etherealized his spiritual agents that they soon came to be identical with ideas of feminine grace and beauty.

Sylt, an island in the North Sea, off the coast of Schleswig-Holstein, to which province of Prussia it belongs; about 22 miles long, very narrow, but with a projecting peninsula on the E. side; area, 40 square miles. It consists mainly of sand dunes, with some pasture for sheep. The inhabitants, about 3,400 in number, are mostly Frisians by origin, and are largely engaged in fishing. The island is also a sea-bathing center.

Sylva, Carmen, pseudonym of Elizabeth, Queen of Rumania, a German author; born in Castle Monrepos near Neuwied, Rumania, Dec. 29, 1843. In 1869 she was married to Charles, then Prince, now King of Rumania. Among her works (all in German) are: "Rumanic Poems" (1881); "Tem-

pests"; "Songs from the Dimbovitza Valley" (1889). Her tragedy "Master Manole" (1892) had a brilliant success in the Burgh Theater, Vienna. In collaboration with Mite Kremnitz, she wrote some novels: "Astra"; "From Two Worlds"; etc.

CARMEN SYLVA.

Sylvanite, an ore of tellurium; crystallization, monoclinic, rarely occurring in distinct crystals, but in an aggregation resembling writing characters; hardness, 1.5–2; sp. gr. 7.9–8.33; luster, metallic; color and streak, steel-gray, sometimes brass-yellow. Composition: Tellurium, 55.8; gold 28.5; silver, 15.7 = 100, which corresponds to the formula (AgAu)3Te. Occurs usually associated with gold.

Sylvanus, in mythology, a rural Latin deity, who is generally represented as half a man and half a goat. He was sometimes represented as holding a cypress in his hand.

Sylvester I., a Pope who governed the Church during the reign of Constantine I. He was famous for the number of churches completed during his reign, among them the basilicas St. Peter's and St. Paul's; for his various Church laws and his influence over the emperor. He held office in 314–335.

Sylvester II., a Pope, a native of Auvergne, was of an obscure family, but received a superior education, studying first in the monastery of Aurillac and afterward in Spain. He was made abbot of Bobbio by the Emperor Otto II., and became very distinguished as a teacher. His attainments in science procured him the reputation of a magician. Among the numerous useful inventions attributed to Sylvester II. is the balance clock which was in use till the adoption of the pendulum in 1650. Sylvester II. was tutor to Otho III., and subsequently head of the school of Rheims, which he made one of the first in Europe. Robert, afterward King of France, was among his pupils. He was called to the papal chair on the death of Gregory V., and administered the affairs of the Church with much prudence and moderation. He was the first French Pope. He died at a great age in 1003.

Sylvester III., for three months the anti-Pope of Benedict IX. and Gregory VI., but deposed by the Synod of Sutri in 1046.

Sylvester, James Joseph, an English mathematician; born in London Sept. 3, 1814, studied at St. John's College, Cambridge, and was successively professor in University College, London, in the University of Virginia, in the Johns Hopkins University, Baltimore, and at Oxford (Savilian professor, 1883). He published many memoirs in the scientific journals, and received many medals and honors. He died March 15, 1897.

Sylvester, Joshua, an English author; born in England in 1563. His life was divided betwixt merchandise and poetry, but in neither did he achieve success. Of his original works, we have no trace, except the title of the poem published about 1620, entitled "Tobacco Battered and the Pipes Shattered by a Volley of Holy Shot Thundered from Mount Helicon"; but in virtue of the great though short-lived popularity obtained by his English version of the "Divine Weeks and Works" of Du Bartas he lives in literary history a kind of shadowy life. It was especially popular with the Puritans and was one of the sources of inspiration for Milton's "Paradise Lost." He led a somewhat wandering existence, and died in Middelburg, Holland, Sept. 28, 1618.

Sylvia, a genus of insessorial birds of the dentriostral tribe, type of the family *Sylviadæ* or warblers, of which *S. sylvicola* (wood warbler or wood wren), *S. trochilus* (the willow warbler), and *S. hortensi* (the garden warbler), and *S. rubecula* or *Erythyaca rubecula* (the redbreast), are common examples.

Sylvine, or **Sylvite,** an isomeric soluble salt found in large crystals at Stassfurth, Prussia; hardness, 2.0; sp. gr. 1.9–2; colorless; luster, vitreous. Composition: Potassium 52.5; chlorine, 47.5 = 100, equal to the simple formula KCl.

Symbiosis, a biological term introduced by De Bary to denote certain kinds of physiological partnership between organisms of different kinds. Consortism is synonymous. As there are many kinds of organic association, it is convenient to restrict the term symbiosis to such intimate and complementary partnerships as exist between algoid and fungoid elements in lichens, or between unicellular algæ and radiolarians. In organic nature there is no isolation; no organism lives or dies to itself; there are countless vital associations, some very in-

direct and external — *e. g.*, the mutual dependence of some flowers and insects — others very direct and intimate, as in the symbiosis of algæ and radiolarians. It often happens that two organisms live together without there being any apparent vital bonds between them; thus diatoms may be "epiphytic" on algæ; algæ, lichens, mosses, ferns, orchids, etc., are often epiphytic on trees; many algæ are "epizoic" on animals — *e. g.*, those which live among the hairs of sloths; and one animal may be epizoic on another, as sponges often are on zoöphytes. Again, there may be external partnerships, such as those between pilot fish and shark, or between beef-eater birds and wild cattle. These suggest cases of mutualism or commensalism, such as the partnership between certain hermit crabs and sea anemones. Probably the constant occurrence of colonies of the alga anabæna in the leaves of the aquatic plant azolla is a similar partnership. Alike in symbiosis and in commensalism the partnerships are advantageous to both of the associated organisms, and are therefore to be distinguished from parasitism, in which the benefit is all on one side. It is useful to distinguish these different grades of association, but it cannot be pretended that the distinctions are rigid.

Apart from lichens, the partnership of unicellular algæ with raidiolarians is the best-known case of symbiosis. The partner algæ — known for a long time as "yellow cells" — used to be variously interpreted as reproductive cells, secretory cells, reserve stores, parasites, and so on; but the researches of Geddes, Brandt, and others demonstrate their algoid and truly symbiotic nature. They have a cellulose wall (except in the *Acanthometridæ* among radiolarians), a nucleus, two pigments, of which one is at least closely analogous to the ordinary chlorophyll of plants; they are able to live and multiply after removal from their host or after its death; in sunlight they evolve oxygen and form starch; they multiply as do free unicellular algæ. From his experiments Geddes inferred that the starch formed by the algæ may be absorbed by the radiolarians; that when they die the algæ are digested by their partners; that during life they absorb carbonic acid and nitrogenous waste from the radiolarians and in turn liberate oxygen which may accelerate the vital functions of their bearers. It seems that the partnership is distinctly advantageous, for the algæ flourish and multiply, and those radiolarians which are without algæ are few and much less common than the vast majority which exhibit symbiosis. Brandt's results are for the most part in agreement with those of Geddes, though divergent on some points of details. The algæ may belong to a distinct genus (*Zooxanthella* of Brandt, *Philozoon* of Geddes), or may be simply the swarm-spores of various olive-green seaweeds.

Similar symbiotic algæ occur in some *Foraminifers*, in several *Cœlenterates*, especially otherwise colorless sea anemones, and, according to Geddes, in some species of the *Turbellarian Convoluta*. Brandt maintains that in the fresh-water sponge and in the fresh-water hydra there are symbiotic algæ of the genus *Zoochlorella*, but Ray Lankester has shown to the satisfaction of most naturalists that the pigmented bodies in those animals are no more symbiotic algæ than are the green corpuscles in the leaf of a buttercup. Many marine sponges are infested by various kinds of algæ, but we do not know that they exhibit any real symbiosis.

In regard to some green protoza there is much dispute whether the green color is due to chlorophyll bodies or to symbiotic algæ. Some forms — *e. g.*, *Stentor polymorphus*, *Coleps viridis*, *Ophrydium viride*, and *Vorticella chlorostigma* — also occur in a colorless state. Geza Entz regards the bodies as algæ, Miss Salitt as chlorophyll corpuscles. Famintzin finds *Zoochlorellæ* in species of *Paramœcium*, *Stentor*, and *Styloniehia*, which he regards as symbiotic forms of the Protococcus-like *Chlorella* which he and Beyerinck have discovered living freely. Thus it appears that, while many cases of symbiosis are indubitable, there are other cases in regard to which judgment must be for a time suspended.

Symbol, that which specially distinguishes one regarded in a particular character, or as occupying a particular office, and fulfilling its duties; a figure marking the individuality of some being or thing; as, a trident is the symbol of Neptune. In chemistry, an abbreviation of the name of an elementary body: thus C for carbon, H, hydrogen, P, phosphorus, etc. When two or more of the names begin with the same letter, a second letter is added to the symbol of one of these elements for the sake of distinction: thus Cl = chlorine, Hg = hydrargyrum (mercury), Pb = plumbum (lead), etc. The symbol also represents a definite quantity of the element: thus H always = one part by weight of hydrogen, Hg = 200 parts of mercury. In theology, a primitive name for the Creed, often occurring in the works of the early fathers. The precise meaning of the word symbol in this sense is doubtful; but it probably had reference to the Creed as the common bond of faith. The tradition that the same was given because each of the apostles composed an article, is unsupported by evidence. Also, sometimes applied to the elements in the Sacrament of the Eucharist.

Mathematical symbols are of four kinds: (1) Those which stand for quantities; such as letters standing for numbers, time,

space, or any of the geometrical magnitudes. (2) Those of relation, as the signs, =, >, : :: :, etc., which indicate respectively, the relations of equality, inequality, proportion, etc. (3) Those of abbreviation, as, ∴, for "hence," ∵, for "because"; exponents and coefficients are likewise symbols of abbreviation, the symbol consisting in the manner of writing these numbers. (4) Symbols of operation, or those employed to denote an operation to be performed, or a process to be followed; such are the symbols of algebra and the differential and integral calculus, etc., which do not come under the preceding heads. Those of the third class are generally regarded as symbols of operation. Symbols of operation are of two kinds: (1) Those which indicate invariable processes, and are, in all cases, susceptible of uniform interpretations. This kind includes most of what are usually called the signs of algebra, as +, −, ×, ÷, √. (2) Those which indicate general methods of proceeding without reference to the nature of the quantity to be operated on.

Symbolics, a theological term for the study of creeds and confessions of faith, etc., from the ancient meaning of the word symbolon, a brief compendium, a creed.

Symbranchidæ, in ichthyology, a family of *Physostomi;* eel-like fishes, having the body naked or covered with minute scales; the upper jaw is entirely formed by the premaxillary bones, the maxillaries being placed behind them in a parallel position. Pectoral and ventral fins are absent, and the vertical fins are reduced to membranous folds; there is no swimming-bladder, and the stomach is without pyloric appendages. The family is divided into the three following groups, the first two of which are fresh-water, but sometimes entering brackish water; the third is marine:

(1) Amphipnoina, containing one genus, with a single species, *Amphipnous cuchia,* from Bengal.
(2) Symbranchina, with two genera, Monopterus and Symbranchus.
(3) Chiloranchina, containing one genus, with a single species, *Chilobranchus dorsalis,* from Australia and Tasmania.

Syme, James, a Scotch surgeon; born in Edinburgh, Scotland, Nov. 7, 1799; was educated at the High School and university of his native city, and studied anatomy under Barclay and Liston, visiting also Paris and Germany. In 1829 he opened Minto House Hospital, which he carried on for four years with great success as a surgical charity and school of clinical instruction; and in 1833 he was appointed Professor of Clinical Surgery in Edinburgh University. In 1847, on Liston's death, he accepted the same professorship in University College, London; he soon, however, returned to his former chair in Edinburgh and continued to hold it till his death. Among his numerous writings are a "Treatise on the Excision of Diseased Joints," and "Principles of Surgery." He died in Edinburgh June 26, 1870.

Symmachus, Quintus Aurelius, a Roman statesman of the 4th century A. D., and one of the last great advocates of paganism; was educated in Gaul; and after serving as quæstor and prætor became Corrector of Lucania and the Brutii (365) and Proconsul of Africa (373), and member of the pontifical college. His petition to Gratian, urged on the senate's behalf, for the restoration of the altar of Victory, proved unavailing (382), as did the extant letter addressed by him when præfect of the city (384) to Valentinian. The failure led him to side with the pretender Maximus (387), and for so doing he was impeached of treason, but pardoned and raised to the consulship (391). His death must have taken place after 404, and we have by him 10 books of letters (1653), and fragments of nine orations, the latter discovered and edited by Mai (1815). "Even saints," says Gibbons, "and polemic saints, treat Symmachus with respect," though Prudentius likened the use to which he applied his talents "to one digging in mud with an instrument of gold and ivory."

Symmes's Hole, an imaginary aperture in the earth's crust near N. lat. 82°, imagined by Capt. John Cleves Symmes (1780–1829) to communicate with the interior of the planet, which he thought was inhabited with animal and plant life, and lighted by two subterranean suns, Pluto and Proserpine. Humboldt states that Symmes repeatedly and publicly invited him and Humphry Davy to descend to the earth's interior by this hole. Jules Verne made this idea the basis for his story, a "Journey to the Center of the Earth."

Symmetrical, in botany (of the parts of a flower), related to each other in number, the same in number, or one a multiple of the other, as in *Saxifraga,* which has five divisions of the calyx, five petals, and five stamens; or *Epilobium,* which has a four-parted calyx, four petals, and eight stamens.

In mathematics, possessing the attribute of symmetry; having corresponding parts or relations. In geometry, two points are symmetrically disposed with respect to a straight line, when they are on opposite sides of the line and equally distant from it, so that a straight line joining them intersects the given line, and is at right angles to it. A curve is symmetrical with respect to a straight line, when for each point on one side of the line there is a corresponding point on the other side, and equally distant from it. The line is called an axis of symmetry. In conic sections, the axes are the only true axes of symmetry. Two plane

figures are symmetrically situated with respect to a straight line, when each point of one has a corresponding point in the other on the opposite side of the axis, and equally distant from it. A line or surface is symmetrical with respect to a plane, when for each point on one side of the plane there is a second point on the other side, equally distant from it. The plane is called the plane of symmetry, and is, in conical sections, a principal plane. Symmetrical lines and surfaces in space cannot, in general, be made to coincide with each other. Spherical triangles are symmetrical when their sides and angles are equal each to each, but not similarly situated. In analysis, an expression is symmetrical with respect to two letters, when the places of these letters may be changed without changing the expression. Thus the expression $x^2 + a^2x + ab + b^2x$ is symmetrical with respect to a and b; for, if we change the place of a and b, we have $x^2 + b^2x + ba + a^2x$, the same expression. An expression is symmetrical with respect to several letters, when any two of them may change places without affecting the expression; thus, the expression $ab + ba^2 + a^2c + c^2a + b^2c + bc^2$, is symmetrical with respect to the three letters, a, b, c.

Symonds, John Addington, an English author; born in Bristol, England, Oct. 5, 1840; was educated at Harrow and at Balliol College, Oxford. His great work is the "Renaissance in Italy" (1875–1886). Among his other works are: "Study of Dante"; "Studies of the Greek Poets"; "Sketches in Italy and Greece"; "Sketches and Studies in Italy"; translation of the "Sonnets of Michael Angelo and Campanella"; "Animi Figura," a collection of sonnets; "Vagabunduli Libellus"; "In Nights and Days"; "Essays Speculative and Suggestive. He died in Rome, Italy, April 19, 1893.

Sympathetic Ink, a colorless ink, the writing made with which is made visible by a subsequent operation — warmth, or other reacting stimulant.

Sympathetic Medicine, an old method of treatment based on magic, and owing its origin, in every case, to the fact that a subjective connection between the malady or injury and the means of cure was mistaken for a real and objective connection. Well-known examples of this mode of treatment are Sir Kenelm Digby's Sympathetic Powder, the Doctrine of Signatures, and the practice of Chinese physicians at the present day, who, in the absence of a necessary drug, will write the prescription on a piece of paper and administer an infusion of the writing in water, or the ashes of the burnt paper, to the sick man. Dryden, in his version of the "Tempest," introduces this treatment by sympathy; and how closely it is connected with magic may be seen in the "Lay of the Last Minstrel," where the Lady Margaret acts as leech to the wounded William of Deloraine.

Sympathetic Nerve, in anatomy, a nerve, or system or nerves, running from the base of the skull to the coccyx, along both sides of the body, and consisting of a series of ganglia along the spinal column by the side of the vertebræ. With this trunk of the sympathetic there are communicating branches which connect the ganglia, or the intermediate cord, with all the spinal and several of the cranial nerves proceeding to primary branches on the neighboring organs or other ganglia, and finally numerous flexures of nerves running to the viscera. Various fibers from the sympathetic communicate with those of the cerebro-spinal system. The term sympathetic has been applied on the supposition that it is the agent in producing sympathy between different parts of the body. It more certainly affects the secretions. Called also sympathetic system.

Sympathetic Powder, in old medicine, powder of sympathy; a powder of vitriol, introduced by Sir Kenelm Digby (1603–1665), who published a small book ("A Late Discourse," etc.), on its merits, and made known the method of its preparation in his "Chymical Secrets." The powder was said to be highly efficacious "in stanching of desperate bleeding at the nose, in stanching the blood of a wound, and in curing any green wound (where there is no fracture of bones) without any plaister or oyntment, in a few days." In the case of an incised wound, the powder was infused in water, and "into this water they did put a clout or rag of cloth embrued with the blood of the party hurt (the rag being first dry), but if it was fresh and moist with the reeking blood, there was no need but to powder it with the small powder of the same vitriol." Sir Kenelm goes on to say that "the same cure is performed by applying the remedy to the blade of a sword which hath wounded a person." The wound itself was to be washed clean, the edges brought into apposition and bandaged. Dunglison hereupon remarks:

> "Under such treatment it was of little importance what application was made to the instrument; binding up the wound, bringing the edges in apposition, defending it from extraneous irritants, and leaving it to the restorative power which is seated in almost every part of an organized body, is the approved method of managing incised wounds at the present day.

Sympathetic Sounds, sounds produced from solid bodies by means of vibrations of some sounding body, these vibrations being communicated by means of the air or some intervening solid body.

Sympathetic Strike, a labor strike carried out by other crafts than the one pri-

marily concerned, to the end that the first strike may be forced to a successful issue by a general cessation of business till the point in dispute in the initial strike may be decided. Of such a character was the great railroad strike in the United States in 1894, when the railroad employés struck in sympathy with the Pullman Car Company's employés. See STRIKES: LABOR, COURT OF.

Sympathy, a feeling corresponding to that felt by another; the quality or state of being affected by the affections of another, with feelings corresponding in kind if not in degree; compassion, fellow feeling, commiseration. Sympathy is first evoked in small societies, such as a single family or a small tribe, and gradually extends beyond these limits. After a time it is found capable of embracing a nation, but foreigners excite antipathy rather than sympathy. Next it entertains a certain amount of beneficent feeling toward mankind in general. One of its latest moral acquisitions is to go forth toward the lower animals, as shown, for example, by the efforts to prevent their being cruelly and thoughtlessly treated. The latter possess it among themselves; thus Indian crows have been seen feeding two or three of their companions which were blind. Also, an agreement of affections or inclinations; a conformity of natural temperament, which makes two persons pleased or in accord with each other; mutual or reciprocal affection or passion; community of inclination or disposition.

In physiology and pathology, reciprocal action of the different parts of the body on each other; an affection of one part of the body in consequence of something taking place in another. Thus, when there is a local injury the whole frame after a time suffers with it. A wound anywhere will tend to create feverishness everywhere; derangement of the stomach will produce headache, liver complaint will produce pain in the shoulder, etc. Also, the influence exerted over the susceptible organization of one person, as of a hysteric female, by the sight of paroxysms of some nervous disease in another or in others.

Symphony, in music, a form of orchestral composition. The name was originally applied to the purely instrumental portions of works primarily vocal, under it being included overtures to operas and oratorios as well as ritornelli and the introduction to choruses and arias. It received its first restrictive meaning toward the end of the 17th century when, under Lulli and Alessandro Scarlatti, the various instrumental pieces in the operas began to grow in importance: it was then reserved for the opening section or overture which consisted of a series of contrasted movements without definite rule as to their number or arrangement. Subsequently a plan, attributed to Lulli and known as the "ouverture à la manière française," prescribed three movements, the first and third slow and the middle one quick and bright. Its place was eventually taken by the "Italian overture," in which the three movements were retained but in inverse order, the first and last being quick and the second slow.

This form was identical with that of the clavier sonata, to which, however, the overture long remained inferior in respect of the internal structure of its movements, few composers caring to show themselves at their best in pieces to which talkative audiences paid little heed. As a further result of such inattention it seemed to be forgotten that the overture should fitly foreshadow the work which it preceded: its material, consequently, became distinct and independent, so that it was only natural that the best examples should in course of time find their way into the concert room, where they met with a more courteous reception. A new outlet being thus provided, original works were soon forthcoming; and with the liberation of the symphony from its operatic surroundings its development as an abstract form of art may be said to have begun.

Meanwhile the reinforcement of the ordinary stringed orchestra by certain wind instruments introduced fresh possibilities of expression which reacted on the material of which the movements were composed. In some of Stamitz's symphonies a fourth movement is also found in the shape of a minuet and trio; and with this the external outline reaches completion. It was not, however, till 1788, the year in which Mozart wrote his great examples, that the symphony attained the rank of an important work of art. In these three works, the E flat, G minor, and C major symphonies, an extraordinary advance is visible both in expression and in richness of instrumental effect. Haydn, though born nearly 20 years before Mozart, wrote his most important symphonies during the 18 years he survived his younger contemporary. But the symphony was brought to its most perfect stage of development by Beethoven. Not only did he determine the constitution of the orchestra and expand and elaborate the existing features of the different movements, but to all this he added in his subject matter a depth of human emotion such as hitherto had never come within the scope of musical expression. The essential qualities of his music are nobility of thought allied to perfection of detail, and a true balance between material and form.

The Eroica, C minor, and A major stand as the most perfect examples of the classical symphony, and also mark the close of the classical period. For, as the perfection of the symphony was due to the increased value of the subject matter, it was natural

when the emotional domain of music became still more extended that composers should find themselves somewhat circumscribed by the limitations of the old form. Beethoven himself is an instance of this, for the 9th Symphony he substitutes for the usual finale an elaborate choral setting of one of Schiller's odes. Succeeding writers have mostly aimed at a compromise between their poetical instincts and their regard for conventional rule. Among such may be mentioned Schubert, Spohr, Berlioz, Raff, and Schumann, the work of the last being the most important. Mendelssohn was content with the true classical form. The same may be said of Brahms, who, however, has enriched it with so many interesting and characteristic features as to constitute an important departure.

Symphoricarpus (named from the cluster of berries), St. Peter's wort, a genus of *Lonicereæ*, with a four-celled ovary, having two cells abortive, and the other two each with one hard seed. North American shrubs: *S. racemosus* is the snow berry; *S. vulgaris* the common St. Peter's wort, a native of the United States, which has red cup-shaped berries.

Symphytism, in philology, a term applied by Earle to a tendency, in that class of words called by him symbolic, to attach themselves to other words, so that the resulting compound is either really one word, or presents the appearance of being one word.

Sympiesometer, an instrument invented by Mr. Adie, of Edinburgh, Scotland, for measuring the weight of the atmosphere by the compression of a column of gas. It consists of a column of oil supported by atmospheric pressure, and rising, not like the mercury of the barometer into a vacuum, but against a body of hydrogen gas which acts like a spring against the column of oil; and as the elasticity of the hydrogen varies with every change of temperature, a movable thermometer-scale is attached for making the necessary corrections. The sympiesometer is graduated by placing it together with a standard barometer and thermometer in a glass vessel, in which the pressure of the air can be varied at pleasure. The top of the column is marked at the points where the barometer shows 27, 28, 29, 30, 31 inches respectively. The spaces between the marks coinciding with the inches of mercury, are then subdivided into 100 equal parts each, and the great range makes the instrument valuable for recording minute variations, subject to correction, depending on the variation in the volume of the hydrogen, due to changes of the temperature. A graduated sliding scale assists in reaching the corrected result.

Symplocarpus, in botany, a genus of *Orontieæ*. Leaves large, stalked; spathe cucullate; spadix globular, covered with perfect flowers; perianth four-parted, at last fleshy; stamens four; style four-angled; ovary one-celled; fruit confluent, one-celled, one-seeded. *S. fœtidus*, or *Pothos fœtida*, so called from its fetid smell, is a powerful antispasmodic and expectorant; it is valued as a palliative in paroxysms of asthma.

Symplocos, the typical genus of *Symploceæ*. Leaves alternate, exstipulate; flowers axillary, calyx half-inferior, three-parted; corolla monopetalous, three to ten-parted, white or scarlet; stamens indefinite; ovary three to five-celled, each cell with four ovules; fruit, a drupe, with three to five cells each, one-seeded. Known species about 30. The leaves and bark of *S. cratægoides* yield a yellow dye; its seeds furnish an oil; its bark is considered tonic, and is used in India in ophthalmia. The leaves of *S. spicata* are also used for dyeing; the bark with indigo to produce different shades of green. The red wood from the root of *S. phyllocalyx* is used by the Nepaulese for caste marks; its root and leaves yield a yellow dye. The ashes of *S. racemosa* are employed as an alkali, as an auxiliary with other dyes, or as a tan. Its bark is cooling and astringent. It is given in India in diarrhœa, and is employed in making plasters. Mixed with sugar it acts on relaxed mucous membranes. A decoction of the wood is made into a gargle for spongy bleeding gums. All these are trees from the Himalayas, or other Indian mountains. The bark of *S. (Bobua) laurina* is used in Bengal as a mordant for a red dye. *S. tinctoria*, the sweetleaf of Carolina, dyes yellow, and has a bitter and aromatic root. *S. alstonia*, or *Alstonia theæfolia*, from New Granada, is astringent. Its leaves are used as tea.

Synacmic, in botany, of or belonging to synacmy, having the stamens and pistils in the same flower mature at the same time.

Synagogue, a congregation or assembly of Jews for the purpose of worship or the performance of religious rites. Also, a building set apart for Jewish as a church or chapel is for Christian worship. Under the Mosaic law worship of the highest type could take place only at one chosen spot (Deut. xii: 5, 21; xvi: 6), that divinely chosen early in the monarchy being Jerusalem (II Chron. vi: 5, 6), though gatherings took place in various other localities (II Kings, iv: 23). Meetings at stated times for worship do not seem to have arisen till the time of the Exile, when the services of the Temple were perforce in abeyance. They constituted the germ of the subsequent synagogues, which are believed to have begun among the Jews resident out of Palestine. In Psalm lxxiv: 8, the persecutors are represented as burning up all the synagogues of God in the land. Jesus

taught or preached and wrought miracles in the synagogues of Capernaum (Matt. xii: 9, Mark i: 21, Luke vii: 5, John vi: 59), in that of Nazareth (Matt xiii: 54, Mark vi: 2, Luke iv: 16), and elsewhere (Luke iv: 15). Many Jewish synagogues are said to have existed in Jerusalem, besides one or more for foreigners (Acts vi:9). Out of Palestine the Apostles found synagogues in Damascus (Acts ix: 2, 20), Antioch in Pisidia (xiii: 14), Iconium (xiv: 1), Thessalonica (xvii: 1), Berea (10), Athens, (17), Corinth (xviii: 1, 4, 8) Ephesus (xviii: 19, xix: 8), and doubtless also in other places. Synagogues were usually built on elevated sites, suggested by Prov. i: 21, and Ezra ix: 9, often outside cities and towns, by the side of a river or small stream (Acts. xvi: 13). The edifice was shaped like a theater, with the door on the W. side, entering which one was conventionally supposed to look E. to Jerusalem, even though that city might be to the W. of the place. This was suggested by I Kings viii: 29, Dan. vi: 10, etc. The wooden chest or ark containing the scrolls of the law and vestments was on the E. side, with a canopy above, or in a recess or sanctuary. In front of it were the desk of the reader or preacher and a platform, with arm-chairs for the elders, who faced the ordinary worshipers. The men sat on one side of the synagogue and the women on the other; they were moreover separated by a partition about six feet high. A light was kept perpetually burning. The governing body was the elders (Acts xviii: 15), presided over by a ruler of the synagogue (Mark v: 22, Luke xiii: 14), with two judicial colleagues, three almoners or deacons, a leader of the worship (Luke iv: 20), a servant like a caretaker, and the 10 men of leisure pledged to attend and constitute a congregation if no others came. The Law and the Prophets were read, with liturgical prayers, chanting of the psalms, and recitals of the 10 commandments, the whole concluding with a benediction. The synagogues were used not only as places of worship, but as law courts, taking cognizance of petty offenses, the decisions of which were carried out within the sacred edifice (Matt. x: 17, Mark xiii: 9, Luke xii: 11, xxi: 12, Acts xxii: 19). Essentially the same arrangements obtain in the modern synagogue.

The Great Synagogue, a "synagogue," or ruling religious assembly constituted probably by Nehemiah (not, as some have thought, by Ezra) about 410 B. C., continuing about 116 years, and developing about 300 B. C., into the SANDHEDRIM (*q. v.*). It sought to keep the people from intermarriage with the heathen, to compel them to observe the Sabbath and the Sabbatical year, and to make proper contribution for divine worship, besides seeing that the text of Scripture was kept pure. It is generally stated that there were 120 members. The Great Synagogue is never mentioned in the Old Testament, in the Apocrypha, or in Josephus or Philo, which has led Michaelis and other writers to doubt if it ever existed.

Synanceia, in ichthyology, a genus of *Scorpænidæ;* the general appearance of the species, especially of the head, monstrous; scaleless, soft warty protuberances or filaments on skin; mouth direct upward, wide, villiform teeth in jaws, sometimes on vomer; eyes small; from 13 to 16 dorsal spines; pectorals very large. There are four species from the Indo-Pacific, attaining a length of 18 inches at most. They are greatly dreaded on account of the wound they can inflict with their dorsal spines, each of which, in its terminal half, is provided with a deep groove on each side, at the lower end of which is a pear-shaped bag containing the venom, and prolonged into a membranous duct, and open at the point of the spine. Persons wading with naked feet in the sea often step on these fish, which lie hidden in the sand, when the spines enter the skin, and the poison is forced into the wound by the pressure of the foot on the poison bag. Many cases are on record in which such wounds have been fatal.

Synapta, in zoölogy, a genus of *Holothuroidæ,* belonging to the order *Apoda,* or to the family of *Synaptidæ.* The body is vermiform, or slug-shaped, and the calcareous matter secreted by the integument is reduced to scattered spicules. Calcareous spiculæ from the coal measures, and from secondary and tertiary deposits have been referred to this genus.

Synapticulæ, in zoölogy, transverse calcareous bars which stretch across the interseptal loculi in the *Fungidæ,* and form a kind of trellis work uniting the opposite faces of adjacent septa.

Synaptura, in ichthyology, a genus of *Pleuronectidæ,* with 18 species from the Indian Ocean, and two from the Mediterranean and the coast of Portugal. Eyes on the right side, the upper in advance of the lower; mouth-cleft narrow; vertical fins confluent; lateral line straight.

Synchronograph, a telegraphic device invented by Prof. Albert C. Crehore, of Dartmouth College, and Lieut. George O. Squier, two young scientists who were associated in the development of the polarizing photo-chronograph, the machine adopted by the United States government for measuring the velocity of projectiles. The invention of the synchronograph is based on the use of alternating currents in telegraphing. In the instruments now in common use, a continuous current is employed. This current is broken to make the required

dots and dashes, by which the messages are sent, resulting in "sparking" and delay. In an alternating circuit, however, there is a point at each alternation when the current is not running at all. This exact instant is seized in the new machine for making and breaking the circuit, and hence the "sparking" and consequent delay are avoided. In the words of Professor Bedell, the signaling over a line is accomplished by means of omitting particular waves of the alternating current.

The transmitting instrument of the new system is a pair of electrical contacts between which runs a perforated tape. This tape, which really sends the message, is made by an instrument like a typewriter by pressing the keys by which perforations are formed. The passage of the tape between the electrical contacts makes and breaks the circuit. At the receiving end is a rapidly revolving photographic plate, which is exposed to waves of light made to vary by means of the alternating current sent over the line. On this plate is left a succession of small marks which may easily be read in the Morse alphabet. Of course the plate must be developed and the message transcribed in ordinary writing. A chemical receiver is being developed, however, which is expected to do away with the delay in developing the plate. The startling feature of the synchronograph is the remarkable speed with which messages can be sent, the rate of transmission being in the neighborhood of 3,000 words each way a minute.

Syncladei, a section of mosses with fasciculate branches, the female flower occupying the place of a branch, or united in the axes of two or more branches. Antheridia at the tips of short reflexed ramuli, inserted singly among the leaves. Only one natural order, *Sphagnei.*

Syncopation, in grammar, the contraction of a word by the omission of one or more letters or syllables from the middle. In music, suspension or alteration of rhythm by driving the accent to that part of a bar not usually accented. Syncopation may be completed in a bar, or it may be carried by sequence through several bars, or it may be so that more than one bar is involved in the syncopation. Syncopated counterpoint is the fourth species of counterpoint.

Syncope, the name given to that form of death characterized by failure and cessation of the heart's action as its primary feature. The term is also applied to the state of fainting produced by a diminution or interruption of the action of the heart, and of respiration, accompanied with a suspension of the action of the brain and a temporary loss of sensation, volition, and other faculties. Fatal syncope is usually the result of some nervous "shock," resulting from some severe lesion of organs, or from a want of blood, or an altered and abnormal state of blood pressure. Ordinary syncope is caused chiefly by weakness, mental emotion, etc. The fainting patient should be placed on a couch and the head kept low; while great caution must be observed in stimulating the action of the heart.

Syncretism, or **Syncratism,** attempt to establish a comprehensive scheme intended to unite or blend harmoniously one with the other principles or parties in irreconcilable antagonism. Specifically, in philosophy, the blending of the tenets of different schools into a universal system A party among the Platonists, at the revival of letters, to which belonged Ammonius, Picadella Mirandola, Bessarion, and other eminent men, have received the name of Syncretists.

Syncretistic Controversy, the name given to a series of controversies which arose in the Lutheran Church in the 17th century, from the subject of the discussion — the promotion of fellowship and union between the Protestant churches of Germany. These controversies may be grouped into three periods:

(1) From the Colloquy of Thorn (1645), in which it was sought to force a new confession of faith on the Lutheran Church, to the death of Calixtus (1656). George Calixtus was a Professor of Theology at Helmstadt, and his scheme of union was founded on the following propositions: (1) That the fundamental principles of Christianity were maintained pure in the Roman, Lutheran and Reformed Churches. (2) That the tenets and opinions which had been constantly received by the ancient doctors during the first five centuries were to be considered as of equal truth and authority with the express declarations and doctrines of Scripture. (3) That the Churches which received these points, and held the additional tenets of the particular churches as non-essential, should come into peaceful relations, and thus pave the way for a future union. After the death of Calixtus, there was a period of peace for about five years.

(2) From 1661–1669. The conflict was renewed by the wish of the Landgrave of Hesse-Cassel, William VI., to secure a religious constitution broad enough to embrace both the Lutheran and Reformed Churches. The second attempt to have the Consensus adopted, which implicitly condemned Calixtus and his adherents as non-Lutheran and heretical, was a failure, and the subject was abandoned for a time.

(3) In 1675, Calovius, Professor of Divinity at Wittenberg, reopened the controversy, and compelled the University of Jena to disavow all sympathy with the views of Calix-

tus. The death of Calovius in 1686 put an end to the dispute.

Syndic, an officer of government invested with varying powers in different places; a kind of magistrate intrusted with the management of the affairs of a city or community; also one chosen to transact business for others. In the University of Cambridge, England, syndics are chosen from the senate to transact special business, as the regulation of fees, the operations of the Clarendon Press, etc.

Syndicates, originally, councils or bodies of syndics; afterward, associations of persons formed with a view of promoting some particular enterprise, discharging some trust, or the like; now, combinations of capitalists for the purpose of controlling production and raising prices; popularly known in the United States as "trusts."

Synecdoche, in rhetoric, a figure in which the whole is put for a part, or a part for the whole, as the species for the genus, the genus for the species, etc., as, a fleet of 10 sail.

Synergism, in Church history, a type of Semipelagianism which came into prominence in Germany in the 16th century, and which had for its chief representatives Erasmus and Melanchthon. Luther taught that the Fall rendered man incapable of all good, and powerless to contribute anything to his conversion. Synergism, on the other hand, taught that "God does not deal with man as with a block, but draws him so that his will coöperates"; and this view was adopted in the Leipsic Interim (1548). A controversy arose on the subject, caused by the publication of a book in 1558 on the "Liberty of the Will," by Pfeffinger, a professor at Leipsic, which university together with Wittenberg represented the Synergist view. Flacius, Professor of Theology at Jena, took the strictly Lutheran view which was adopted in the Formula of Concord.

Synergus, in entomology, a genus of *Cynipdæ. S. vulgaris* has the mouth, antennæ, and legs red. It breeds in cuckoo fashion, in the galls produced by *Cynips quercus folii,* ultimately devouring its larvæ.

Synesius, Bishop of Ptolemais in the Libyan Pentapolis, acted also the various parts of soldier, diplomatist, orator, philosopher and poet; born in Cyrene about A. D. 375. The contemporary of Augustine, he took pride in tracing his descent from the Heraclidæ, the royal family of Sparta, who first colonized the Pentapolis, and inherited wealth and estates in the interior. He studied at Alexandria under Hypatia, whose influence over him proved a dominant and lifelong one. He used to turn to her for advice when in difficulty and for sympathy when in trouble. He also studied in Athens which disappointed him; and he returned to the Pentapolis, resolved to spend his life in study and in the pursuits of a country gentleman. Of hunting in particular he was passionately fond. About 399 he was appointed by his fellow citizens a delegate from Cyrene to bring certain grievances before the Emperor Arcadius at Constantinople. He remained in that city for three years. In his speech "On Kingship" Synesius warns Arcadius sternly of the perilous nature of the times and points out the duties of a good king. During his stay at Constantinople a revolution took place, Arcadius was driven out by the Scythian general Gainas, and Aurelian, leader of the national party, banished.

While waiting for an audience Synesius wrote a curious book entitled "Concerning Providence." In the form of an allegory he describes the contest between Aurelian and Gainas, under the veil of a conflict between Osiris and Typhon, who personify Good and Evil; and deals with the question why God permits evil and delays so long to interfere. In a few weeks Gainas fell, Synesius attained the end of his mission, and sailed for home. The voyage from Alexandria was a perilous one, which Synesius describes in a long and delightful letter. The next eight years were a time of peace and happiness for Synesius; "books and the chase," he writes, "make up my life." About 403 he married a wife belonging to Alexandria. During these years he wrote his treatise "Concerning Dreams," a half-burlesque essay, "The Praise of Baldness" (he was bald himself), his "Dion, or on Self-discipline," setting forth his ideal of the philosopher, the second part of his book on "Providence," several "Hymns," and a great many letters. This peaceful period was interrupted by war. The Libyan nomads made raids on the fertile Pentapolis; there were no soldiers at Cyrene, but Synesius raised a troop of volunteers. The helpless governor Cerealius fled; Cyrene was besieged and Synesius had to organize and direct the defense of the city.

Up to this time Synesius appears before us as a man of letters, steeped in Greek literature and philosophy, and standing quite outside of Christianity. Doubtless the horrors of war and barbarian invasion forced on his mind the weakness of Neoplatonism. In 411 the people of Ptolemais, fearing the appointment of a corrupt governor, fixed on Synesius as their bishop. Synesius was most unwilling; but at last he yielded and was consecrated at Alexandria in 410. From this time to his death his life was burdened and weighed down by constant private troubles and public calamities. On his return to Ptolemais finding the new governor Andronicus playing the tyrant he boldly excommunicated him, and secured his recall.

As a bishop Synesius acted with great prudence and decision, yet his conscience troubled him, and he felt he had been presumptuous in undertaking such an office. The Ausurians invaded the country, and Synesius had again to spend his nights on the ramparts and direct the defense. His only surviving child died. Synesius was broken with troubles, and both his philosophy and his religion appeared to fail him in his need. The city was relieved, but he fell ill and about 413 he died. His last letter was written to Hypatia who retained all his old affection and reverence. His last 'Hymn" with its humble prayer for deliverance from indwelling sin, contrasts strongly with the Neoplatonic doctrines of the earlier hymns. Hypatia's name for him, "the good of other people," indicates the unselfishness of his nature. His 156 letters reveal a character fascinating in many ways, a man open-eyed, of high spirit and awake to every call of duty, sound and healthy in body and mind, passionately fond at the same time of intellectual pursuits and of sport, not without vanity, but with no sensual element. In many ways he reminds one of Charles Kingsley. The "Hymns" show Synesius as the poet of Neoplatonism; their keynote is the longing of the soul to rise to intellectual communion with God.

Synetheres, in zoölogy, the type genus of *Synetherina*, with 8 or 10 species from tropical America. They have only four toes on the hind feet, but in place of the hallux, there is a fleshy pad between which and the toes the animal can grasp objects with tenacity.

Synetherina, New-world porcupines, or tree porcupines; a group of *Hystricidæ*, with three genera, *Erethizon*, *Synetheres*, and *Chætomys*. They have rooted molars, complete collar bones, tuberculate soles, and four mammæ; the upper lip is uncleft, and there is no trace of a pollex. The spines are largely mixed with long, soft hair, and the tail is long and prehensile.

Syngenesia, in botany, the 19th order in Linnæus' artificial classification. The anthers, and more rarely the filaments, are united into a cylinder or tube. It contained the *Composites*, etc., and was divided into the orders *Polygamia Æqualia*, *Polygamia Superflua*, *Polygamia Frustranea*, *Polygamia Necessaria*, *Polygamia Segregata*, and *Monogamia*.

Syngenesious, or **Syngenesian,** in botany, having the anthers united by their margins into a tube, as in the composites, in the violet, the balsam, etc.; of or belonging to the class syngenesia.

Syngenesis, in botany, the theory which considers the embryo to be the product of both male and female. It is as old as Empedocles, though it had no better basis than the observed resemblance between the offspring and both parents. Modern research has furnished a scientific basis by showing that, while in the higher animals both ova and spermatozoa are equally indispensable, they are themselves only modifications of one and the same anatomical element.

Syngenite, a monoclinic mineral, occurring in small tabular crystals in rock salt at Kalusz, Galicia; hardness, 2.5; sp. gr. 2.603. Composition: A hydrated sulphate of potash and lime, the formula being, $CaOSO_3KOSO_3 + H_2O$.

Syngnathidæ, pipe fishes; a family of *Lophobranchii;* gill openings reduced to a very small opening near the upper posterior angle of the gill; one soft dorsal fin; ventrals, and sometimes one or more of the other fins, absent. They are small marine fishes, abundant on the coasts of the tropical and temperate zones where the marine vegetation is thick enough to offer them shelter. All the species enter brackish, and some fresh water. There are two groups: Hippocampina and Syngnathina.

Syngnathus, pipe fish; the type genus of *Syngnathidæ*, with about 50 species; its distribution nearly coincides with that of the family. Body with the ridges more or less distinct; pectorals well-developed, caudal fin present; dorsal opposite or near the seat; egg pouch as in *Siphonostoma*.

Synod, a meeting or assembly of ecclesiastical persons for mutual deliberation on matters of difficulty or of general interest affecting the churches over which they rule, and designed for their guidance. In the early Church there were four kinds of synod. First, an Œcumenical, that is, a General or Universal Synod, commonly called a General Council; second, a National Synod, attended by the clergy of one nation only; third, a Provincial Synod, attended by the clergy of a province; and fourth, a Diocesan Synod, attended by the clergy of of a single diocese. Among the Presbyterians a synod is a "court" intermediate between the General Assembly and a Presbytery, or, if no Assembly exist, it is then itself the highest court. It is divided into Presbyteries, of which there are never less than three. Each congregation is represented by a minister and an elder.

Synod of Dort, a synod held at Dort, Dordt, or Dordrecht, in Southern Holland, in 1618 and 1619, to discuss the views of Arminius, which it condemned.

Synodical Period, in astronomy, the period between two successive conjunctions or oppositions of two heavenly bodies. A synodical month is a lunation, being the period from one full moon to the next full moon, or from new moon to next new moon.

It is 29 days, 12 hours, 44 minutes, 2.37 seconds.

Synodontis, in ichthyology, a genus of *Siluridæ Etenobranchiæ*, group Doradina, with 15 species, characteristic of tropical Africa. Adipose fin moderate or long, dorsal with very strong spine, and seven soft rays; teeth in lower jaw movable, long, very thin at base; mouth small, barbels six, more or less fringed; neck with broad dermal bones.

Synœcium, in zoölogy, a genus of *Botryllidæ*, with one species, from the Arctic Seas. Animals semi-cartilaginous, cylindrical, stalked, solitary, or gregarious; systems circular, terminal tunicaries six to nine in a group, apertures six-rayed.

Synonyms, or words having the same signification, strictly speaking, do not exist in any language; and in the popular use of the term synonyms are words sufficiently alike in general signification to be liable to be confounded, but yet so different in special definition as to require to be distinguished. The opposite of synonyms are antonyms.

Synoptic Gospels, the first three Gospels, Matthew, Mark, and Luke, which regard events from the same point of view, and present close resemblances to each other. Four hypotheses have been framed to account for the correspondences: (1) That the Synoptic Gospels were derived from a common written source or sources. (2) That the earlier Gospels were consulted in the composition of the later ones. (3) That all the three were derived from oral tradition. (4) That they were all derived partly from oral tradition, but that the second was also copied from the first, and the third from the first and second. The Synoptic Gospels treat of the humanity rather than the divinity of Jesus, though not in any way ignoring the latter.

Synovia and **Synovial Membrane.** Synovia is a glutinous fluid secreted by synovial membranes. Synovial membranes are simply modifications of serous membranes, and they invest the tendons and sinews that play over joints and otherwise assist articulations. The synovial fluid is therefore merely a secretion from a serous membrane. It appears, however, to differ in certain particulars from ordinary serous secretions, and is more dense and viscid than ordinary serum. Hence synovia is often popularly named "joint oil." In synovia an abundance of albumen is present. Synovial membranes also invest the bursæ, or little pads which underlie such tendons as those of the extensor muscles of the thigh, in which tendon the patella or knee cap is developed. Synovial membranes are liable to inflammation, known as synovitis.

Syntax, that part of grammar which treats of the manner of connecting words into regular sentences, constructing sentences by the due arrangement of words or members in their mutual relations according to established usage. In every language there is some fundamental principle which pervades and regulates its whole construction, though it may occasionally admit of particular variations. In some languages the principle of juxtaposition prevails, and little diversity of arrangement is possible, as is the case in English, in which inflections are so few. The relations of the subject, the action, and the object are indicated by their respective positions. In other languages — inflected languages like Latin or Greek — these relations are indicated by the changes in the forms of the words, and the modes of arrangement are various. Still, in the structure and disposition of sentences and parts of sentences the logical relations of the thoughts must regulate the construction, even where it appears to be most arbitrary.

Synthesis, in chemistry, the building up of more or less complex bodies by the direct union of their elements, or of groups of elements. Thus, water can be produced synthetically by the union of two atoms of hydrogen with one atom of oxygen. In logic, the method by composition, in opposition to the method of resolution or analysis. In synthesis, we reason from axioms, definitions, and already known principles, till we arrive at a desired conclusion. Of this nature are most of the processes of geometrical reasoning. In synthesis, we ascend from particular cases to general ones; in analysis, we descend from general cases to particulars.

Syntonin, muscle fibrin; Liebig's name for a white, opaque, gelatinous substance, prepared by slightly heating muscle freed from blood with dilute hydrochloric acid, filtering and precipitating with sodic carbonate. It is soluble in dilute hydrochloric acid and in feebly alkaline liquid, but insoluble in a solution of sodium chloride. A similar substance, giving all the reactions of syntonin, is obtained by treating egg albumen with dilute hydrochloric acid.

Syphilides, skin affections of syphilitic origin. They are usually copper-colored rashes, scales, papules, pustules, crusts, ulcers, and cicatrices, and have been arranged in eight groups: Vegetative, exanthematous, vesicular, squamous, papular, pustular, bulbous, and tubercular.

Syphiliphobia, syphilitic monomania; a morbid fear of being affected by syphilis, producing some imaginary symptoms of the disease, and often leading to suicide. The most obstinate cases are in women.

Syphilis, according to Dr. Farr, a disease belonging to the enthetic order of

Syphilis

zymotic diseases. It may be defined as a specific disease produced by the contagion of the same disease in another person, and characterized (1) in its primary form by the appearance on the part inoculated of one of two different kinds of a sore or chancre, and (2) in its secondary or constitutional form by various eruptions on the skin, by sore throat, affections of the eye, the glands, the bones, and almost every other tissue of the body. The contagion may be conveyed by direct inoculation during sexual intercourse; accidentally, in other forms of personal contact, and purposely, by inoculation for medical or experimental purposes. There are two kinds of chancre, and in one the disease is merely local, never affecting the constitution; but in the other the constitution is affected, and the disease may break out after long intervals of health, and may be transmitted from one generation to another through the blood of the mother or the semen of the father.

The local form of syphilis appears in three principal varieties—(1) The common soft chancre unaccompanied by bubo; or suppurative syhilitic inflammation. Three or four days after inoculation the sore appears and begins to suppurate at once. The sore has a punched-out appearance, its edges are slightly undermined, and its base is thickened by inflammation of the parts underneath it. The sore heals with no remaining induration in three or four weeks. (2) The sore with suppurating bubo; or ulcerative syphilitic inflammation. The sore is ragged and has a worm-eaten appearance, the glands and the absorbents are affected, and specific abscesses may form in the course of the latter, but no part of the body beyond the gland is affected. In these two forms the treatments consist in keeping the part clean, applying a mercurial wash, poulticing the bubo and opening it as soon as it suppurates. (3) Sloughing and gangrenous sores. In this form the sore may slough and become gangrenous as soon as it is formed, or a previously formed sore may take on a sloughing action. The absorbents are not affected, nor is it followed by secondary symptoms, but the sloughing may proceed with great rapidity, and may prove fatal from exhaustion or hæmorrhage. The treatment consists in poulticing with charcoal or yeast, and if the sloughing action does not extend deeply, nitric acid may be applied; but if the slough is deep, lotions of nitric acid or carbolic acid, or iodoform, may be applied.

The constitutional form of syphilis is distinguished by the appearance on the part affected of a sore called the hard or Hunterian chancre, and by a chronic engorgement of the lymphatic glands forming a bunch of hard knobs under the skin. The sore may appear in from three to five days after exposure to contagion, and it may vary as the disease is derived from a primary or a secondary sore. Lancereaux found that the mean period of incubation with matter from secondary sores, in cases of experimental inoculation, was 28 days; but in two cases, in which the disease was derived from a primary sore, the period was 18 days. Mr. Holmes says: "Slight itching is first noticed at the part, then redness, and a small vesicle forms, which soon cracks, and induration shows itself at the base of the crack; the sore spreads and becomes excavated and glazed, with little or no granulation on its surface. Its natural secretion, if examined miscroscopically, is found not to be purulent, but to contain only a little granular matter, though the sore can be made to suppurate by the friction of the clothes or by irritating applications. The hardness at the base of the ulcer, from which the sore takes its usual appellation, is of a peculiar kind different from that which is found at the base of a phlegmonoid soft sore, in this that in the Hunterian chancre the hardening feels as if due to a layer of parchment or other hard material let into the tissues; that is to say, it is of limited thickness, and abruptly ceases where the healthy tissues commence; while the hardness at the base of the phlegmonoid sore being due to the infiltration of lymph from common inflammation of the cellular tissue, is of a much less defined character, extends further, and fades away much more gradually into the healthy tissues." Besides the Hunterian chancre, Mr. Lee describes two forms of infecting syphilis, unassociated with ulceration; viz., (1) a pimple, the cuticle appearing as if peeled off the upper part of the glans penis or a circumscribed patch remaining for days together, with a separation of epithelial scales mixed with lymph-globules from the surface, but with no specific induration and (2) an indurated tubercle formed below the skin or mucous membrane without any visible loss of substance.

The general opinion of the medical profession is that the constitutional form of syphilis can be treated efficiently by mercury only, and that the treatment should commence as soon as the disease declares itself. The mildest form is the blue pill, which may be given in doses of three or five grains twice a day in combination with ¼ or ½ grain of powdered opium. This should be continued for about six weeks, or until the sore has been cured, and all hardening around it and around the bubo has disappeared. Mercury may also be given endermically by inunction or fumigation.

The secondary symptoms of constitutional syphilis do not usually appear till after the primary sore has healed; but the period is quite uncertain, though, in the majority of cases, it is under half a year

The secondary symptoms are sometimes ushered in by what is termed the syphilitic fever; but they are generally in the throat, the sore throat being due to an eruption on the mucous membrane of the mouth or fauces; or in the skin, being usually either roseola, lichen, acne, mucous tubercle, pityriasis, psoriasis or lepra. These eruptions are distinguished from other eruptions which are not specific, partly by their coppery color and by their circular or horseshoe form, and by their tendency to disappear at the center and spread from their edges. The eye and the larynx are affected in the latter secondary stage. Periostitis or nodes are also seen at this period. Other secondary symptoms are the development of mucous tubercles — flat, raised, oval patches, generally situated at or near the junction of the skin and mucous membrane and yielding a contagious secretion, probably a fertile source of inoculation. The mucous tubercle generally disappears rapidly under the local application of calomel. Syphilitic vegetations and condylomata are also contagious.

In the treatment of secondary syphilis it is now generally admitted that the administration of mercury is necessary for the complete eradication of the syphilitic diathesis. Mr. Holmes says, "No hesitation need be experienced in prescribing mercury in cases where there is no ulceration or suppuration; but when this is the case, mercury is generally held to be contra-indicated. . . . The administration of iodine and mercury together is a very successful plan of treating secondary syphilis. Thus the iodide of potassium may be given in doses of from 5 to 10 grains while the patient is undergoing a course of mild mercurial fumigation.

The tertiary stage of syphilis is distinguished from the secondary by the occurrence of an interval of health of longer or shorter duration — days, months, or even years — and is characterized by a reproductive process. Lancereaux describes this stage as that of gummatous products, or tertiary and quaternary affections. The affections of the skin are of the suppurative and ulcerative type, such as rupia and ecthyma. The tissues of the bone rapidly soften, and become carious or necrosed. The glands are also deeply affected, even the great secreting and blood glands — the liver, spleen, thyroid, etc. The nervous system is also affected by tertiary deposits in the nerve-structures or their membranes. leading to irritation or paralysis. The treatment of the tertiary stage must be conducted on the same principles as that of the secondary stage.

Infantile or congenital syphilis is transmitted to the fœtus in utero, either through the blood of the mother or the semen of the father, or both, and is a form of secondary syphilis, differing from it only in that the primary sore has occurred on the body of the parent instead of the infant itself. The disease is characterized by a persistent coryza, a reddish or copper eruption — roseola or lichen — especially on the genitals and on the palms and soles. Crescentic patches of mucous tubercle are common on the interior of the mouth, the lips, and anus, and there is a peculiar yellowish complexion. The treatment of congenital syphilis consists in the administration of mercury; 1½ or 2 grains of grey powder with 3 grains of compound chalk powder may be given twice a day, and should be continued for about six weeks, and for a fortnight after all traces of the disease have disappeared.

Syra, the most important, though not the largest of that group of islands in the Ægean Sea known as the Cyclades. It is about 10 miles long by 5 broad, has an area of 42½ square miles and is bare, rocky, and not very fertile. Its prosperity is of quite modern growth. During the War of Independence Syra remained neutral, hence many fugitives of commercial enterprise flocked thither from Chios and other parts of Greece. Pop. of island 31,573. The capital, Syra or Hermoupolis, is situated on a bay on the E. side of the island. It rises in terraces from the shore, is well built, and is the seat of government for the Cyclades, and the seat of a Roman Catholic bishop. This port is the chief commercial entrepôt of the Ægean. Every year it imports, principally manufactured wares (one-third of total), hides, grain and flour, yarns, timber, iron, salt fish, rice and coal to the average value of $6,052,500, and exports tobacco, emery stone, valonia, sponges, and fresh vegetables to the average value of $516,400.

Syracuse, a city and county-seat of Onondaga co., N. Y.; on Onondaga Lake, the Erie canal, and the Rome, Watertown, and Odgensburg, the Lackawanna, the West Shore, the New York Central and Hudson River, and other railroads; about midway betwen Buffalo and Albany. The present city comprises the former villages of Danford, Geddes, Syracuse, and Salina. Owing to its large salt interests it is known as "Salina City," and owing to its geographical situation in the State as "Central City."

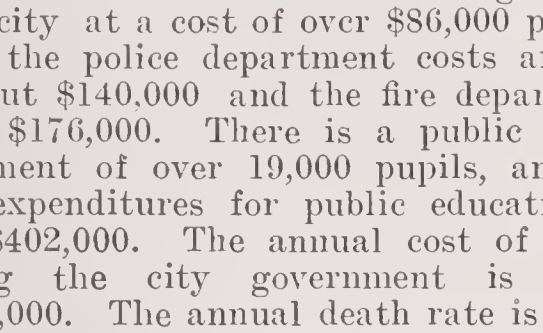
Business Interests.— The chief industry has always been the manufacture of salt. There are numerous salt companies, which manufacture both by solar and artificial heat, employing a vast amount of capital and hundreds of men. Other industries include iron furnaces, machine shops, manufactories of silver, tinware, sheet iron, coach and wagon factories, and breweries. There are 6 National banks in operation, and many daily, weekly and monthly peri-

odicals. The assessed property valuations exceed $91,000,000, and the total bonded debt $7,000,000.

Public Interests.— The city has an area of 22 square miles; 300 miles of streets, of which 46 miles are paved; a system of waterworks, which cost $4,200,000, with 161 miles of mains; and a sewer system covering 80 miles. The streets are lighted by electricity at a cost of over $86,000 per annum; the police department costs annually about $140,000 and the fire department about $176,000. There is a public school enrollment of over 19,000 pupils, and annual expenditures for public education of over $402,000. The annual cost of maintaining the city government is about $1,745,000. The annual death rate is about 13.36 per 1,000. The noteworthy institutions and buildings include SYRACUSE UNIVERSITY (*q. v.*), Sacred Heart Academy for Boys and Girls, St. John's Academy for Catholic Boys, Keble School for Girls, high school, the Franciscan Convent, House of the Good Shepherd, State Hospital for Feeble-minded Children, St. Vincent's Orphan Asylum, and other charitable institutions, the United States government building, etc. The city is the seat of a Protestant Episcopal and a Roman Catholic bishop. Among the local attractions are the Onondaga Indian Reservation, and the Genesee and Burnett parks.

History.— In 1654 when first visited by Jesuit missionaries, the site was owned by the Onondaga Indians. The State purchased the tract containing the salt springs under treaties with the Indians in 1778 and 1795. Later parts of the tract were purchased by individuals. It was first permanently settled in 1797; was incorporated as a village in 1826; and received its city charter in 1847. Pop. (1890) 88,143; (1900) 108,374; (1910) 137,249.

Syracuse, anciently a famous city of Sicily; on the S. E. coast of the island; 80 miles S. S. W. of Messina; was founded by



COIN OF SYRACUSE.

Corinthian settlers about 733 B. C. The colonists seem to have occupied the little isle of Ortygia, which stretches S. E. from the shore. The settlement rapidly rose to prosperity, and toward the end of the 6th century B. C. sent out colonies of its own. Little is known of the early political state of Syracuse; but about 485 the ruling families, probably descendants of the original colonists, were expelled by the lower classes of citizens. Gelon, despot of Gela, restored the exiles and at the same time made himself master of Syracuse. He increased both the population and the power of his new state, and won the highest prestige by a great victory over the Carthaginians at Himera. In his time Achradina, a triangular tableland N. of Ortygia and on the adjoining mainland, was built on. This ultimately became the most extensive and populous quarter; it contained the Agora, a temple of Zeus Olympius, the Prytaneum, with a splendid statue of Sappho and fine monuments to Timoleon and the elder Dionysius, etc. At a later date, and possibly thus early, there were two other quarters in the city — Tyche, occupying a plateau to the W. of Achradina; and Neapolis (New City), stretching along the S. slopes of the plateau, and overlooking the marshes of Anapus and the Great Harbor, a spacious and well-sheltered bay to the S. W. of Ortygia. This islet, however, contained the citadel, which overlooked the docks in the Lesser Harbor on the N.

Hiero, the successor of Gelon, was celebrated throughout the Greek world as a patron of the fine arts and of men of genius, as Æschylus, Pindar, etc. In 467 B. C. the democracy again got the upper hand — Thrasybulus, Hiero's brother and successor, a "tyrant" of the baser sort, being expelled; and for 60 years a free and democratic government was enjoyed, under which Syracuse flourished more than it had ever done. During this period occurred the great struggle with Athens (415–414 B. C.), and the celebrated siege by the Athenian armament, a contest in which the Sicilian city came off victorious. Nine years later Dionysius restored the "tyranny" of Gelon, and during a reign of nearly 40 years greatly increased the strength and importance of the city. It was he who constructed the docks in the Greater and Lesser Harbors, and surrounded the city with fortifications. His fierce war with Carthage (397 B. C.) raised the renown of Syracuse still higher. The reigns of the younger Dionysius and of Dion, the friend of Plato, were unsettled; but after the restoration of public liberty by Timoleon (343 B. C.) a brief season of tranquillity ensued. In 317 B. C., 20 years after the death of the noble Timoleon, Agathocles, a rude soldier of fortune, once more restored the despotic form of government, which continued with scarcely an interruption through the reign (50 years) of the enlightened Hiero II., the friend and ally of Rome, down to the conquest of the city by the Romans after a siege of two years, in which Archimedes perished (212 B. C.). This event was occasioned during the Hannibalic war by Hieronymus, a rash and vain young man, aban-

doning the prudent policy of his grandfather, Hiero, breaking the alliance with Rome, and joining his and their foes, the Carthaginians. Under the Romans Syracuse slowly declined, though with its handsome public buildings and its artistic and intellectual culture, it always continued to be the first city of Sicily. It was captured, pillaged, and burned by the Saracens in A. D. 878, and after that sank into complete decay.

The modern city, Siracusa, is confined to the original limits, Ortygia, which, however, is no longer an island, but a peninsula. The streets, which are defended by walls and a citadel, are, with few exceptions, narrow and dirty. Syracuse has a cathedral (the ancient temple of Minerva), a museum of classical antiquities, a public library with some curious MSS., numerous churches, monasteries, and nunneries, the ancient fountain of Arethusa (its waters mingled with sea water since the earthquake of 1170), and remains of ancient Greek and Roman temples, aqueducts, the citadel Euryalus, a theater, an amphitheater, and quarries, besides ancient Christian catacombs. The people manufacture chemicals and pottery, and trade in fruits, olive oil, wine (exports), wheat, timber, and petroleum (imports) to the annual value of $1,250,000. Pop. (1901) 32,030.

Syracuse University, a coeducational institution in Syracuse, N. Y.; founded in 1871 under the auspices of the Methodist Episcopal Church; has an endowment exceeding $2,070,000; grounds and buildings valued at over $2,750,000; scientific apparatus, etc., $315,000; volumes in the library, 78,000; average number of faculty, 240; average student attendance, 3,250; graduates since opening, over 5,300; ordinary income, about $750,000.

Syr=Daria. See JAXARTES.

Syria, a country of Western Asia, embracing the regions that lie between the Levant and the Euphrates from Mount Taurus in the N. to the S. border of Palestine, or even to the peninsula of Sinai. The E. boundaries S. of the Euphrates are not clearly defined or marked off from the wide expanse of the Arabian desert. The physical conformation of Syria is throughout simple and uniform. A range of mountains, split in the N. into two parallel chains — Libanus and Anti-Libanus — fronts the Mediterranean, ranging in height from 6,000 feet in the N. up to 10,000 feet in the central parts, but falling again in the S. to 3,500 feet. Behind these mountains lies a table-land, that gradually falls away E. to the desert. The prevailing winds being W., the slopes of the mountains next the Mediterranean and the valleys ensconced among them, together with the immediate seaboard, get a tolerably plentiful supply of moisture during the rainy half of the year (October to May); snow even falls on the highest summits of the mountain ranges. The climate on the plateau is generally dry, and in certain localities hot. The valley of the Jordan is remarkably hot. The soil is in many parts possessed of good fertility, and in ancient times, when irrigation was more extensively practised, yielded a much greater return than it does at the present time. Damascus is noted for its gardens and orchards. Hauran produces excellent wheat. Northern Syria is the home of the olive. The vine grows in nearly all parts of the country. Fruit (oranges, figs, etc.) is cultivated on the coast plains. Sheep and goats are the most important of the domestic animals. The principal exports are silk, cereals, wool, olive oil, lemons and oranges, soap, sponges, sesame, licorice, cottons, and tobacco. Manchester (England) goods constitute the chief item in the imports. Besides these there are woolens, rice, copper and iron, sacking, timber, and hides. The chief port is Beyrout, and to it must be added Acre, Caiffa (Haifa), Tyre, and Tripoli. The pop. is estimated at 3,317,600. The bulk of the inhabitants are Mohammedans, but do not all profess the orthodox Sunnite creed: for instance, there are the Druses, certain sects of Shiites, and others. The Christians make up about one-fifth of the total. The principal ethnic elements in the population are descendants of the ancient Syrians (Aramæans) and Arabs, these last both settled and nomad; besides there are Jews, Turks, and Europeans.

The earliest historical records that treat of Syria are those that relate the histories of the Hittites, the Phœnicians, and the Hebrews. The first named were for several centuries supreme in Northern Syria, and at times stretched their authority S. as far as the hills of Southern Palestine. Yet they had most formidable rivals on both sides of them in Assyria and Egypt, from both of which countries their subjects derived no small share of their skill in manufacturing industry, and in the arts and manners of life. The other two peoples mentioned occupied the most prominent place in Southern Syria. Nevertheles at different periods we read of flourishing Aramæan (Semitic) principalities, such as Damascus, Hamath, Zobah, and similar petty states. These, as well as most of Northern Syria, were conquered during the 8th century B. C. by the kings of Assyria; the Jewish kingdoms experienced the same fate at the hands of the Babylonian kings in the 7th and 6th centuries. As previous to the 9th century B. C. Syria had been the battle ground of the Egyptian and Hittite armies, so after that period it was, as a province of Assyria (Babylonia), involved in the struggle between that great empire and Egypt. (The

Greeks first knew this region as a province of Assyria; hence the contracted name Syria.) Toward the end of the 6th century B. C. Syria fell under the dominion of the Persian empire; and two centuries later it was conquered by Alexander of Macedon. When his empire broke to pieces the Seleucidæ made Antioch the capital of their empire of Syria. From the Seleucidæ it passed, through the hands of Tigranes of Armenia, to the Romans, for whom it was won by Pompey in 64 B. C. Under these new masters the country flourished and became celebrated for its thriving industries, its commercial prosperity, and its architectural magnificence (see BAALBEK: NABATÆANS: PALMYRA). On the division of the Roman world Syria became part of the Byzantine empire, and of it remained a province till its conquest by the Mohammedan Arabs in 636. It still continued to be prosperous under the Arabs and their successors the Egyptian sovereigns, in spite of the unsettled period of the Crusades. The first severe blow it suffered came from the Mongols in 1260, and its ruin was completed when in 1516 it passed from the Egyptians to the Ottoman Turks, its present rulers.

Syriac, a dialect or branch of the Aramaic, and thus one of the Semitic family of languages. It was a vernacular dialect in Syria during the early centuries of our era, but ceased to be spoken as a living language about the 10th century, being crowded out by that of the Arabian conquerors. A very corrupted form of it, however, is still spoken by a few scattered tribes, and principally by the Nestorians of Kurdistan and Persia. Syriac literature had its rise in the 1st century of our era. At first it was chiefly connected with theological and ecclesiastical subjects, Biblical translations and commentaries, hymns, martyrologies, liturgies, etc., but in course of time it embraced history, philosophy, grammar, medicine, and the natural sciences. The oldest work in the language still extant is the incomplete translation of the Bible called the Peshito. In addition to the Peshito Version, which was recognized as the authorized version by all the various sects of the Syrian Church, there is one made in the beginning of the 7th century by Paul of Tela, a Monophysite; this is based on the Hexaplar Greek Text, that is, the Septuagint with the corrections of Origen, and is of very great value for the criticism of the Septuagint, supplying as far as a version can the lost work of Origen. Another version, the Syro-Philoxenian, translated by Polycarp under the auspices of Philoxenus, Bishop of Hierapolis (488–518), and revised by Thomas of Heraclea in 616, is very inferior to the Peshito. Among the MSS. brought by him from Syria in 1842 Dr. Cureton discovered an imperfect copy of the Gospels, differing widely from the common text, and which he supposed to belong to the 5th century. The most learned representative of the orthodox Syrian Church is undoubtedly Ephraem Syrus, who flourished in the 4th century. The Syriac literature, like the language, was superseded by that of the Arabians. The latest Syriac classic writer is Bar-Hebræus, Bishop of Maraga, who died in 1286. The greater part of this literature has been lost, but much valuable material still remains unedited.

Syrian Catholics, a term which should properly include all Christians using a Syriac liturgy, but confined by ecclesiastical writers to converts from the Jacobite or Monophysite Church in Syria.

Syrian Jacobites, the members of the church that once pervaded Syria. The great body of them now reside near Mosul and Mardi, in Mesopotamia, others are in or near Aleppo. A large colony, now however much reduced by conversions to Roman Catholicism, exists in Malabar and Travancore in India. They call themselves Jacobites, nominally from the patriarch Jacob, really from Jacob Bardæus, Bishop of Orfa (Edessa), who died in 558, and who was successful in reuniting the Monophysites. They use the Syriac language in their liturgy.

Syrian Rite, Church of the, a portion of the Oriental church which had its seat in Syria, and comprised those Christians who used the Syriac liturgy of St. James. This liturgy was originally composed for the patriarchate of Antioch, which included the churches of Palestine and Mesopotamia, and according to tradition by the Apostle James. There is no Greek MS. of it in existence of an earlier date than the 10th century, but the Syriac liturgy of the same name almost exactly answers the description given of it in various writers. After the Mohammedan conquest (638) the orthodox Syrians were drawn into closer association with the patriarchate of Constantinople, and then adopted the liturgy of St. Chrysostom, which was used by the rest of the Eastern Church. By the orthodox Greek Church of Jerusalem, then, the liturgy of St. James is used in the Greek form only once a year, namely, on the Festival of St. James. But it is still used in its Syriac form by the Monophysites or Jacobites, as well as by the Maronites. The latter renounced the Monothelite heresy (1182), and entered into communion with the Church of Rome, to which they were formally reunited at the Council of Florence (1445); but notwithstanding this union they have always retained a kind of independence, and especially their own liturgical customs. A Maronite college was founded at Rome, 1584, for the education of their clergy, where worship is conducted according to the Syrian rite.

Syringa, in botany, the lilac; a genus of *Fraxineæ.* Deciduous shrubs, with simple leaves, and very fragrant flowers in terminal thyrsoid panicles. Calyx small, four-toothed; corolla funnel-shaped, its limb four-parted; stamens two; stigma bifid; fruit a capsule, with two boat-shaped valves, having a dissepiment in the middle, two cells, and two seeds. Known species about six. Natives apparently of Southeastern Europe and Central and Eastern Asia. *Syringa vulgaris* is the lilac. *S. persica* is a smaller species or variety, with pinnatifid leaves, supposed to have come from Persia. There are three common varieties of it in nurseries, the white, the cut-leaved, and the sage-leaved Persian lilac. *S. josikæa,* a Transylvanian shrub, has scentless flowers. The leaves of *S. emodi,* a large Himalayan shrub, are eaten by goats.

Syringe, a small portable hydraulic instrument of the pump kind, used to draw in a quantity of water or other liquid, and eject the same with force. In its simplest form it consists of a small cylindrical tube having an air-tight piston fitted with a rod and handle at the upper end. The lower end terminates in a small tapering tube. This being immersed in the fluid, the piston is drawn back, and the liquid is forced into the cylinder by atmospheric pressure. On pushing the piston back again to the lower end of the cylinder the liquid is ejected in a jet. The syringe is used by surgeons, etc., for washing wounds, injecting liquids into animal bodies and similar purposes. Larger forms are used for watering plants, trees, etc.

Syrinx, a nymph beloved by Pan, and, according to the legends, turned into reeds, when flying from him. The god is said to have constructed his pipe from those reeds.

Syrphidæ, in entomology, a family of *Diptera,* tribe Athericera (having the antennæ of three joints, the apical one with a bristle). The *Syrphidæ* has the antennal bristle finely feathered; the eyes are large, meeting in the males; the ocelli three; proboscis generally short, the terminal lobes fleshy, inclosing three bristles; palpi small, with one joint; abdomen flattened, with five segments; tarsi with two pulvilli. Smooth or hairy insects, often seen hovering almost without motion over the flowers of Composites or other plants, some of them looking like bees, from which they may at once be distinguished by their having only two wings, and being destitute of a sting. The species are numerous, and the larvæ diverse in habits. Most of the latter feed on the roots or bulbs of plants, or live in decaying wood, mud, or sewers, or in the water, or as parasites in the nests of wasps and humble bees, or crawling over plants in quest of aphides. Genera more than 40 and among them *Syrphus, Volucella, Eristalis, Helophilus,* etc.

Syrphus, the typical genus of *Syrphidæ.* The larvæ feed on aphides. One of the most common is *S. pyrastri,* a blue-black fly, with whitish or yellowish transverse bands on the abdomen, black thighs, and yellowish legs. It is sometimes mistaken for a wasp. The larvæ is a footless grub, living on plants infested by aphides.

Syrrhaptes, in ornithology, a genus of *Pteroclidæ,* with two species. Bill small, conical, nostrils concealed by feathers, tarsi hirsute; toes short, concrete, hirsute above, hallux absent; the two middle tail-feathers and first two quills of wings produced into pointed setaceous filaments. They normally range from Tartary, Tibet, and Mongolia, to the country round Peking, and occasionally visit Eastern Europe; but in 1863 great numbers of them appeared in Europe, and reached W. to the shores of the Atlantic.

Syrtis, the ancient name of two gulfs of the Mediterranean Sea, on the N. coast of Africa. The Syrtis Major, now called the Gulf of Sidra, lies between Tripoli and the table-land of Barca, and forms the most S. part of the Mediterranean. The Syrtis Minor, now called the Gulf of Cabes, lies between Tunis and Tripoli. The shores of both are inhospitable, and abound in quicksands.

Syrup, in popular language, the uncrystallizable fluid finally separated from crystallized sugar in the process of refining, either by the draining of sugar in loaves, or by being forcibly ejected by the centrifugal apparatus in preparing moist sugar, commonly known as golden syrup. By sugar manufacturers the term syrup is applied to all strong saccharine solutions which contain sugar in a condition capable of being crystallized out, the ultimate uncrystallizable fluid being distinguished as molasses or treacle. In chemistry, a saturated, or nearly saturated, solution of sugar in water. In pharmacy, syrups; a preparation in which sugar forms an important ingredient, and gives a peculiar consistence to the liquid. Its general use is to disguise the flavor of drugs; but in some cases, as in that of the iron iodide, the sugar preserves the active ingredient from undergoing chemical change. About 17 syrups are used in pharmacy. Among them are *S. aurantii, S. Limonis, S. papaveris, S. sennæ,* etc.

Syrus, Publius, or **Publilius,** a Roman writer of mimes who flourished about 43 B. C., and was most probably a Syrian slave brought to Rome in early youth, educated, and freed by some indulgent master. After Laberius he reigned supreme on the stage, and his mimes, being as full of shrewd epi-

grammatic wit as broad humor, did not perish with him. About 200 apophthegms are still extant, under the title "Witticisms of Publius Syrus." One of these supplied the motto for the "Edinburgh Review," though Sydney Smith admits that none of the young collaborators knew anything further of its author: "The judge shall be damned when the innocent is acquitted."

Systyle, in architecture, a term applied to a building in which the pillars are closely placed, but not quite so close as in the pycnostyle, the intercolumniation being only two diameters, or four modules, of the columns. A temple or other edifice which has a row of columns set close together around it, as in the Parthenon, at Athens.

Syzran, a town of Central Russia, a few miles from the right bank of the Volga, and 90 miles S. of Simbirsk. Laid out in 1685, it has tanneries and noted market gardens, and a large trade in grain, timber, salt, and manufactured goods. Pop. 32,377.

Syzygium, or **Sizygium,** (named from the way in which the branches and leaves are united by pairs); a genus of *Myrteæ;* trees or shrubs, with the flowers in cymes or corymbs, the calyx with its limb undivided; the petals, four or five, inserted into the throat of the calyx and fugitive; stamens many, similarly inserted; the fruit baccate, one-celled by abortion; seeds one or two. *S. jambolanum,* called also *Eugenia jambolana,* is a moderate-sized tree, wild or cultivated all over India. The bark is astringent and is used, as are the leaves, in dysentery. The decoction of the bark constitutes a wash for the teeth; its fresh juice with goat's milk, a medicine for the diarrhœa of children. A vinegar prepared from the unripe fruit is a stomachic, carminative, and diuretic. The fruit is astringent, but is eaten by the natives who in time of famine consume also the kernels. The leaves of *S. terebinthaceum* are used in Madagascar to impart an aroma to baths. *S. guineensis* is worshiped in Gambia and the fruit is eaten.

Syzygy, in the plural, in astronomy, linear relations; a term used of the points of a planet, or of the moon's orbit, at which the planet or the moon is in opposition to or conjunction with the sun. In prosody, the coupling of different feet together in Greek or Latin verse.

Szabadka, a royal free town of Hungary; on the plain that lies between the Danube and the Theiss; 106 miles S. by E. of Budapest. It is the center of a rich agricultural district, with a trade in cattle, skins, wool, corn, fruit, tobacco, etc. Pop. (1901) 82,122.

Szaboite (after Prof. J. Szabó, of Budapest), a mineral occurring in minute crystals in cavites of an andesite, Transylvania; crystallization, triclinic; hardness, 6–7; sp. gr., 3.505; luster, vitreous; color, hair-brown to hyacinth-red. Composition: Essentially a silicate of iron and lime. Now shown to be related to hypersthene.

Szaibelyite (after Herr Szaibelyi), a mineral occurring in small nodules bristling with acicular crystals in a limestone at Werksthal, Hungary; hardness, 3–4; sp. gr., 3.0; color, externally white, internally yellow. Composition: After separating impurities, essentially a hydrous borate of magnesia.

Szalay, Laszlo, a Hungarian historian; born in Buda, Hungary, April 18, 1813. He succeeded Kossuth as editor-in-chief of the "Pesti Hirlap," in 1844. Among his works are "History of Hungary" (6 vols. 1850–1863); "Michael Eszterházy" (1862–1866); and "The Book of Statesmen," a collection of political biographies. He died in Salzburg July 17, 1864.

Szarvas, a town of Hungary, on the Körös river, 80 miles S. E. of Budapest. A famous breed of horses is cultivated here. Pop. 24,391, mostly Slovaks, who, however, speak Hungarian.

Szaskaite (after Szaska, Hungary, where found), an earthy variety of calamine (zinc carbonate), stated to contain cadmium.

Szatmar-Nemet, a town of Hungary; on both sides of the Szamos; 68 miles E. N. E. of Debreczin; formed in 1715 by the union of Szatmar and Nemet. It manufactures earthenware, canvas, and slibowiz, a kind of brandy distilled from plums. Pop. (1901) 26,881.

Szechuan, the largest province of China, in the W.; has Tibet on the N. W. and Yunnan on the S. W.; the remaining boundaries are conterminous with various provinces of China; area 218,480 square miles; pop. 68,724,890. It is traversed and watered by the Yang-tsze-Kiang and its affluents, is hilly throughout, mountainous in the W., and rich in natural products, including coal, iron, and other minerals. Opium, silk, salt, sugar, medicines, tobacco, hides, musk, rhubarb, and white wax (produced by an insect) are exported to the annual value of $25,000,000; and European cottons and woolens are imported to the value of $15,000,000 annually. The capital is Ching-tu, the chief commercial town Chung-king, on the Great River, which was opened to foreign trade in the end of 1889. Ichang was thrown open in 1877.

Szegedin, a royal free town of Hungary; at the confluence of the Maros with the Theiss, 118 miles S. E. of Budapest. This town was almost completely destroyed by a terrible flood in March, 1879, out of 6,566 houses 6,235 being overwhelmed. Since then it has been rebuilt, and now possesses

very handsome public buildings, including a town hall, postoffice, law courts, theater, barracks, etc., and is protected against inundations by a double ring of embankments. The Theiss is spanned by a couple of railway bridges and a fine suspension bridge (1,940 feet long), designed by Eiffel. Szegedin manufactures soap, spirits, matches, soda, tobacco, coarse cloth, etc., and carries on an extensive river trade in wood, corn, and wool. A specialty of the place is paprika, a kind of capsicum. From 1526 to 1686 it was occupied by the Turks. Close by Haynau defeated the Hungarians Aug. 3, 1849. Pop. (1901) 102,991.

Szekler, a Hungarian people inhabiting Transylvania, and preserving the Magyar characteristics in their purest form.

Sze-ma, or **Suma Kwang,** one of the most eminent statesmen and writers of China, and as a historian second only to Sze-ma Ts'ien; born in 1009. He is renowned as the author of "The Comprehensive Mirror of History," in 294 books, the labor of 19 years. It covers a period from the beginning of the 4th century B. C. to A. D. 960. He died in 1086.

Sze-ma, or **Suma Ts'ien,** author of the first general history of China; born in Lung-Mun, in what is now the province of Honan, about 163 B. C. In 110 B. C. he succeeded his father, Sze-ma T'an, as grand recorder and astronomer, and took up the historical work begun by him. It was finished in 91 B. C., and was named "Shihki," or "Historical Records." It covers the period from 2,697 to 104 B. C. He is also noted for reforming the calendar. The chronology settled on by him still prevails in China.

Szigligeti, Eduard, real name JOSEPH SZATMÁRY, a Hungarian dramatist; born in Nagy Varad, Grosswardein, March 18, 1814. He wrote about 100 plays between 1834 and 1872. Several of his comedies and tragedies were crowned by the Academy. Among his best dramas are: "The Deserter"; "A Brace of Pistols"; "The Jew"; "The Foundling." He wrote also: "The Drama and its Different Forms" (1874); "Biographies of Hungarian Actors" (1878). He died in Budapest, Jan 18, 1878.

Szmikite (after Herr Szmik), an amorphous mineral, stalactitic; hardness, 1.5; sp. gr., 3.15; color, whitish; on fracture, reddish-white to rose-red. Composition: Sulphuric acid, 47.43; protoxide of manganese, 42.01; water, 10.65 = 100.09. Found at Felsöbanya, Hungary.

T

t, the 20th letter and 16th consonant of the English alphabet, is a sharp, mute consonant, and closely allied to d, both being dentals. It is formed by pressing the tip of the tongue closely against the root of the upper teeth, and differs from d only in being non-vocal, while d is uttered with voice. T followed by h in the same syllable has two sounds; the one surd or breathed, as in think, thank, thought; the other sonant, or vocal, as in this, that, though. Ti before a vowel, and unaccented, usually passes into sh, as in nounced nashon, porshon, parshal. When s or x precedes ti, the t retains its proper sound, as in question, though before u it is often softened into ch (as in church), as also in such words as mixture, posture, etc. In accordance with Grimm's law, t in English (as also in Dutch, Icelandic, Gothic, etc.) is represented in Latin, Greek, an Sanskrit by d, and in German by s or z. Thus English tooth (for tonth) = Latin *dens* (genitive *dentis*), Greek *odous* (genitive *odontos*), Sanskrit *dant*, German *zahn*, Old High German *zand;* English heart = Latin *cor* (genitive *cordis*), Greek *kardia*, Sanskrit *kridaya*, German *herza;* English eat = Latin *edo*, Greek *edō*, Sanskrit *ad*, Old High German *ëzan*, German *ersen*. If the t is preceded by s, this rule does not apply, as in English stand = Latin *sto*, Greek *histēmi*, German *stehen*. Th in English, etc., is represented in Latin, Greek, and Sanskrit by t, and in German by d; thus, English thou = Latin *tu*, Greek *tu*, Sanskrit *tvam*, German *du*, English three = Latin *tres*, Greek *treis*, Sanskrit *tri*, Old High German *dri*, German *drei*. In a few instances t in English represents an l in Latin, as in tear (s.) = Latin *lacrima*. In bat and mate, t supplies the place of an original k (Old English *bak* and *make*). An original t is sometimes represented by d in English; proud = Old English *prut;* diamond = French *diamant;* card = French *carte*, Latin *charta*. An original t has became th in author = Latin *auctor*. It has disappeared from the middle of a word in best = Old English betst; last = Old English latst; from the end of a word in anvil = Old English anfilt; petty = French *petit;* dandelion = French *dent de lion*. T has crept in (1) after s, as in behest, amongst, against, amidst, whilst, betwixt; (2) in tyrant = Old French *tiran*, Latin *tyrannus;* parchment = Old French *parchemin;* cormorant = French *cormoran;* ancient = French *ancien;* pheasant = Old French *phaisan*. Th represents an original d in hither, thither, whether, faith = Old French *feid*, Latin *fides*. An original th has become d in could = Old English *cuthe;* fiddle = Old English *fithele;* Bedlam = Bethlehem; it has become t in theft = Anglo-Saxon *theofth;* nostril = Anglo-Saxon *nasthyrlu;* it has disappeared from Norfolk = North-folk; worship = Anglo-Saxon *weorthscipe*. T is often doubled in the middle of words, occasionally at the end, as in butt, mitt. T is often used to denote things of the shape of the capital letter; T-bandage, T-square, etc.

T, as a symbol, is used in numerals for 160, and with a stroke over it for 160,000.

Marked with a t; a thief, an expression equivalent to the *trium literarum homo* of Plautus. The English phrase derives its force from the fact that thieves were formerly branded in the hand with the letter T.

To a t: Exactly; to a nicety; with the utmost exactness; as, that fits me to a t.

Tabard, Taberd, Tabert, or **Tabeld,** a light vestment worn over the armor, and generally embroidered with the arms of the wearer. It was close-fitting, open at the sides, with wide sleeves or flaps reaching to the elbows. It originally reached to the middle of the leg, and was afterward made shorter. It was at first worn chiefly by the military, but afterward became an ordinary article of dress of other classes in England and France in the Middle Ages. The office was created in 1417 by Henry V. for the service of the Order of the Garter, which till then had been attended by Windsor heralds. The tabard is now worn only by heralds and pursuivants at arms, and is embroidered with the arms of the sovereign.

Tabari, Abu Djasar Mohammed ibn Djerir (tä-bä'rē), a celebrated Mohammedan theologian and historian; born in Amul in Taberistan in 839. His two principal writings are: "Tefsir" (exegesis), by far the most authoritative exposition of the doctrine of the Koran; and his "Annals," in which he gives on a theological basis the history of the world from the creation to the year 914. He died in Bagdad in 921.

Tabasco, a gulf State of Mexico, named from a river running into Campeche Bay; area 10,072 square miles; pop. (1900) 159,834. The surface is generally flat except in the S. part, and the soil is fertile, producing a fine variety of coffee. Capital, San Juan Bautista.

Tabasheer, a deposit of hydrated silica, occasionally found in form of a nodule in the interior of certain varieties of bamboo. Those nodules are found at the joints of the plants and resemble an opal. They are of a yellowish-white color, are very brittle, and become transparent when immersed in water. This vegetable genus is very rare, as are the small pearl-like spheres which are found in the pulp of a very ripe cocoanut.

Tabb, John Banister, an American educator and author; born in Virginia, March 22, 1845; was educated for the Roman Catholic priesthood; was professor of English literature at St. Charles College, Ellicott City, Md. He wrote: "Poems"; "Lyrics"; "An Octave to Mary"; "Rules of English Grammar"; "Child Verse" (1899); etc. He died Nov. 19, 1909.

Tabby, silk or other stuff having an irregular waved or watered surface produced by pressure, usually between engraved rollers in the mode of calendering, known as tabbying. There is but little difference between tabbying, watering, and moiré, the effect in each case being produced by the flattening of some of the fibers while the others remain undisturbed, causing the different parts to reflect the light unequally. A mixture of lime with shells, gravel, or stones in equal proportions, forming a mass which, when dry, becomes as hard as rock. It is used in Morocco as a substitute for brick or stone in building. Also a cat of a mixed or brindled kind; a cat generally.

Tabergite (after Taberg, Sweden, where found), a variety of the chlorite group of minerals, which has been referred by different mineralogists both to penninite and clinochlore (Dana's ripidolite). Color, bluish green. From optical observations Des Cloizeaux states that it sometimes consists of uniaxial and biaxial laminæ combined, the axial divergence varying as much as from 1° to 33°, thus indicating a mixture of the members of this group.

Tabernacle, a slightly-constructed temporary building or habitation; a tent, a pavilion. Figuratively, a temple; a place of worship; a sacred place; specifically, the sacred tent built by Moses and maintained as the central place of worship for Israel till Solomon built the temple. Also, the human frame as the temporary abode of the soul.

In Jewish antiquities, more fully denominated Tabernacle of the Congregation, and Tabernacle of Witness, a tent constructed by direction of Moses, under divine authority, to be a local habitation for Jehovah while His people moved from place to place in the wilderness — a temple being obviously unsuitable to the period of the wandering. To obtain materials for the construction of this sacred tent free-will offerings were solicited, and the Jews, in response, brought gold, silver, "brass" (copper), cloths, rams' skins dyed red, oil, spices, precious stones, etc. (Exod. xxv: 1-9; xxxvi: 1-5). Bezaleel and Aholiab, men divinely endowed with genius for the purpose, were the actual builders (xxxv: 30-34; xxxvi: 4). The tabernacle was 30 cubits (*i. e.*, 45 feet) long, 10 cubits (15 feet) wide, and 10 cubits (15 feet) high. The material was "shittim" (acacia) wood, 20 boards of which, standing upright, constituted each of the longer (*i. e.*, the N. and S.) sides, and six the W. one, while the E. end was open. Each board was fastened below by tenons fitting into two silver sockets; they were held in place by five bars of acacia wood on each side and five at the end, passing horizontally through rings of gold fastened in the upright boards. The interior was divided into an outer room 20 cubits long by 10 broad called the Holy Place, or Sanctuary, and an inner apartment 10 cubits (15 feet) long by 10 broad, named the Most Holy Place, or Holy of Holies. At the E. or open end, were five pillars of acacia wood, overlaid with gold, supporting a veil or curtain of fine linen with needlework of blue, crimson, and scarlet. Each pillar stood on a brass socket and was furnished with golden hooks. Between the Holy Place and the Place Most Holy was another veil or curtain of the same material as the first, but the pillars supporting it rested on silver sockets. Four different kinds of curtains or coverings supplied the place of a roof. The first, or inner one, of the same material as the two veils, was of 10 curtains, each 28 cubits (42 feet) long by 20 cubits (30 feet) broad. The covering exterior to this was of fine goats' hair, then there was one of sheep skins dyed red, then one of *tachhash*, rendered in the text of the Revised Version seal skins, and in the margin porpoise skins.

Within the Holy Place, on the N. side, was the golden table with the shew-bread on

it, and on the S. side the golden candlestick, and the golden altar of incense. In the Holy of Holies were the Ark of the Covenant and the mercy-seat (Exod. xxvi: 1–37; xxxvi: 1-38; Heb. ix: 1-5). Around the tabernacle was the court of the tabernacle, 100 cubits (150 feet) long, by 50 cubits (75 feet) broad, surrounded by 60 pillars, each five cubits (7½ feet) high, with silver capitals and hooks, and brass sockets. The four pillars in the E. side supported a veil or curtain constituting the gate of the court. The brazen altar and the laver were in the courtyard. Around the latter were the tents of the Levites, and beyond these those of the other tribes, three on each side of the tabernacle. Only the priests entered the Holy Place. This they did twice daily, in the morning to extinguish the lights, in the evening to light them anew. None but the high priest could enter the Holy of Holies, and he only once a year, on the great day of Atonement. The Gershonites, the Merarites, and the Kohathites took charge of the tabernacle and its furniture when these were removed from place to place. The tabernacle was first set up by Moses on the first day of the second year after the Israelites had left Egypt. After they had reached Canaan it was located at Shiloh (I Sam. iv: 3-22). In Saul's time it was at Nob (I Sam. xxi: 1, and Mark ii: 26). When Solomon became king it was at Gibeon (I Kings iii: 4). Afterward Solomon laid it up in the Temple, of which in all its leading features it had been the model (I Kings viii: 4, II Chron. v: 5). See TEMPLE.

In the Roman Church, a receptacle for the consecrated Host for benediction and the ciborium containing the smaller Hosts which the laity receive. In its present form — a small structure of marble, metal, or wood, placed in the center of the E. side of the altar — the tabernacle dates from the 16th century. Its original form was that of a dove; about the middle of the 14th century it was sometimes placed in an aumbry above the altar. A lamp constantly burns before the tabernacle, which is kept locked, the key never passing out of the charge of the clergy. The name tabernacle is also given to (1) a niche for an image, (2) a reliquary, (3) the aumbry near the high altar when used to contain the reserved sacrament, and (4) the abbot's stall in choir.

As a nautical term, an elevated socket for a boat's mast, or a projecting post to which a mast may be hinged when it is fitted for lowering to pass beneath bridges.

Tabernacles, Feast of, in Jewish antiquities, *Chhag hassukkoth,* one of the three leading Jewish feasts, on the recurrence of which all the males are required to present themselves at Jerusalem. During this feast the people dwelt on their housetops or elsewhere in booths made of the branches of trees, in commemoration of their tent life in the wilderness. Called also the Feast of Ingathering, because it was a feast of thanksgiving for the completion of the harvest and the vintage. It lasted for eight days, from the 15th to the 23d of Tisri, corresponding to October. The first and the eighth days were holy convocations (Exod. xxiii: 16; Lev. xxiii: 34; Num. xxix: 12; Deut. xvi: 13). It is believed that the eighth day of the Feast of the Tabernacles was the ast great day of the feast at which Jesus preached (John vii: 37).

Tabernæmontana, in botany, a genus of *Plumiereæ.* Flowers monopetalous, corolla salver-shaped; stamens five, included; anthers sagittate; style filiform; stigma dilated at the base, trifid; ovaries two, developing into two follicles; seeds immersed in deep-red pulp. *T. utilis,* the hya-hya of Demerara, is one of the cow trees. It pours forth a copious stream of thick, sweet, innoxious milk. *T. coronaria* is a small evergreen shrub, six or eight feet high, with silvery bark and glossy leaves. It is common in India gardens; its native country is unknown. The red pulp obtained from the aril is used as a dye by the hill people. An oil is prepared from *T. dichotoma,* a small Indian tree. The Ceylonese suppose its fruit to have been the forbidedn fruit of paradise. The sap of *T. persicariæfolia,* found in Mauritius, is considered poisonous; its wood is used in turnery.

Tabes, a term formerly applied to a disease characterized by a gradually progressive emaciation of the whole body, accompanied with languor, depressed spirits, and, for the most part, imperfect or obscure hectic fever, without the real cause of the affection being properly localized or defined. Tabes mesenterica, abdominal phthisis, or consumption of the bowels, is a disease of the bowels caused by the formation of tubercles similar to those of the lungs in ordinary consumption. It causes extreme wasting, feebleness, and thinness of body, and recovery is rare. Tabes dorsalis is the same as LOCOMOTOR ATAXIA (*q. v.*).

Tabinet, a rich fabric consisting of a warp of silk or a weft of wool, employed for window curtains and other furniture purposes.

Tabla, Cinchona bark peeled from the trunk of the tree. It is more valuable than that derived from the branches.

Tablature, in anatomy, a division or parting of the skull into two tables. In art, a painting on a wall or ceiling. In music, a general name for all the signs and characters used in music; those who

were well acquainted with these signs were said to sing by the tablature.

Also, a peculiar system of notation employed for instruments of the lute class, for viols, and certain wind instruments. The earliest systems of notation, like the music of Asiatic nations to this day, were different sorts of tablature. That which may be called the modern tablature was invented not earlier than the 16th century. In England tablature was employed for all stringed instruments, the number of lines employed being regulated by the number of strings the instrument possessed. Tablature for wind instruments was expressed by dots on a stave of six, seven, or eight lines, according to the number of holes in the instrument, the number of dots signifying the number of holes to be stopped by the fingers. Organ tablature was a system of writing the notes without the stave by means of letters. Thus, the several octaves were called great, little, one and two-line octaves, according to the style of letter employed to indicate them. The name has also been applied to figured bass.

Tableaux Vivants (tä-blō′ vē-vo*ng′*), "living pictures," representations of works of painting and sculpture, or of scenes from history or fiction, by living persons. They are said to have been invented by Madame de Genlis, when she had charge of the education of the children of the Duke of Orleans. They were long common in theaters, as they are now in private circles.

Table d'Hôte, "the host's table," an ordinary. In the Middle Ages, and even down to the reign of Louis XIV., the landlord's table was the only public dining place known in Germany and France. The first restaurant was opened in Paris during the reign of the Grand Monarque, and was a great success.

Table-land, in physical geography, a plateau; a plain existing at some considerable elevation above the sea. Volcanic rocks often make such table-lands, as in Central India; so do limestones. Or a sea bed or a lake bed, or a great stretch of country, may be upheaved. The chief table-lands are in the Old World, extensive, low-lying plains rather than table-lands characterizing the New. One occupies about half the surface of Asia, being 5,500 miles from E. to W., and from 700 to 2,000 miles from N. to S. In Europe there are table-lands in parts of Switzerland, France, Spain, and Bavaria. African table-lands exist in Morocco, Abyssinia, the region of the Victoria Nyanza, etc. In North America there are plateaux along the Pacific, Labrador, etc., and in South America in Brazil and the adjacent countries.

Table Mountain, a moutain in Pickens co., S. C.; height, 4,000 feet. Also a mountain of South Africa, S. of Table Bay, its highest point being right over Cape Town. It is about 3,500 feet high and level on the top. It joins the Devil's Mount on the E., and the Sugar Loaf or Lion's Head on the W.

Tables, in mathematical science, pure or applied, lists of numbers giving the values of a function of a variable for different values of that variable. The function may be a physical property common to different substances, as in tables of densities, specific heats, etc.; or it may be a mathematical function of a continuously varying variable tabulated for definite successive values of that variable, as in table of logarithms, sines, tangents, and astronomical tables generally.

Table Turning, one of the earliest of the manifestations said to be produced by spiritual agency. A number of persons formed a circle round a table, on which their outstretched fingers lightly rested. After a time the table began to move, and to answer questions either by tilting or rapping at appropriate letters as the alphabet was repeated. The late Professor Faraday was of opinion that a rotary impulse was unconsciously imparted to the table by those who stood around it, and it has been pointed out that pushing may take place without any distinct consciousness on the part of those who push, and that expectant attention is known to produce such a state of the muscles as would occasion this unconscious pushing.

Tablinum, an apartment in a Roman house in the center of the atrium, in which were deposited the genealogical records and archives, and all documents commemorating the exploits which had been performed by members of the family, or which were connected with the high offices which any of them had filled.

Taboo, or **Tabu,** from *tapu,* a Polynesian word, denoting an institution which was formerly in existence throughout Polynesia and New Zealand, but has now to a large extent disappeared before the spread of Christianity and civilization. The word signifies something set apart, either as consecrated or accursed, the idea of prohibition being conveyed in either case, whence the English word, tabooed, *i. e.,* forbidden. For example, in New Zealand the person of a chief was strictly taboo, and hence might not be touched; while the volcano Tongariro was taboo as being the supposed residence of demons, and even to look on it was at one time forbidden. The system seems to have had its origin in a superstitious dread of the unseen powers of evil, and the chiefs, quick to perceive the power which it would place in their hands, appear to have adopted it from remote times as a political engine, the priests readily coöperating with them

for the sake of the influence which it gave them likewise. The chiefs were themselves amenable to the regulations of the taboo, but in a much less degree than their subjects, and possessed a wide discretionary power, which was limited only by precedent, of declaring objects to be taboo. The taboo could be removed only by the person by whom it was imposed, or by one greatly his superior in rank, but courtesy usually kept the latter power in abeyance. So potent was the superstition, that Scherzer states that among the Maories even hostile tribes were in the habit of leaving unharmed all persons and things protected by the taboo. The idols, temples, persons, and names of the king were taboo (or sacred), and almost everything offered in sacrifice was taboo to the use of the gods. Seasons of taboo (on the approach of some festival, before going to war, and in case of the illness of a chief), were either common or strict. During the former the men were only required to abstain from their ordinary pursuits, and attend a religious ceremony morning and evening; during the latter all fires and lights were extinguished, and no person, except those whose attendance was required at the temple was allowed out of doors. The taboo was imposed either by proclamation or by fixing certain marks to the places or things tabooed. The prohibitions and requisitions of the taboo were strictly enforced, and every breach of them punished with death, unless the delinquent had powerful friends who were either priests or chiefs. The king, sacred chiefs and priests seem to have been the only persons to whom the application of the taboo was easy; the great mass of the people were at no period of their existence free from its influence, and no circumstance in life could excuse disobedience to its commands, while, like many of the peculiar customs of lower races, it bore with peculiar hardship on women. A girl was not allowed to eat food that had been cooked at her father's fire, and a wife was forbidden to partake of what she had prepared for her husband and sons, and even to eat in the same room with them. In New Zealand, however, the custom was, in its influence, generally more powerful for good than for evil. The advance of civilization and the influence of the missionaries have done much to abolish it throughout the South Sea Islands, and even where it still lingers the old death penalty for its violation can be no longer enforced.

Tabor, a small shallow drum used to accompany the pipe and beaten by the fingers. The old English tabor was hung round the neck, and beaten with a stick held in the right hand, while the left hand was occupied in fingering a pipe. The pipe and tabor were the ordinary accompaniment of the morris dance.

Tabor, Mount, a solitary elevation on the N. E. border of the plain of Esdraelon. It is remarkable for the symmetry of its form, which resembles a truncated cone, from certain points appearing almost hemispherical. The top measures about half a mile across, and is about 1,300 feet above the level of the plain. Now crowned by a confused mass of broken walls, towers, etc., it has a history extending from the invasion of Canaan by the Israelites (Josh. xix: 12, 22; Judg. iv.) down to the present time. It is not mentioned in the New Testament, but there is a tradition that it was the scene of the Transfiguration. This, however, is rendered impossible by the town on the top.

Tabor, Horace Austin Warner, an American capitalist; born in Holland, Vt., Nov. 30, 1830; went to Colorado in 1859, and engaged in mining. He worked with only moderate success till 1878, when he discovered a rich deposit of silver in what was afterward known as the "Little Pittsburg" mine. A year later he sold his interest in this property for $1,000,000; a sum which eventually yielded him a fortune estimated at $6,000,000. With the increase of his wealth came the desire for political preferment, and in 1878 he was elected lieutenant-governor of Colorado, which office he held till 1884, when he was chosen United States Senator, to fill the unexpired term of Henry M. Teller. Soon afterward he began to suffer serious financial losses. Bad investments and the panic of 1893 swept away all his fortune and drove him to begin life anew as a miner. He returned to Colorado and opened a mine which proved a failure. He was appointed postmaster of Denver in 1898, in which office he continued to serve till his death April 10, 1899. During his prosperous days he did much to improve the city of Denver.

Taborites, a section of Calixtines, who received their name from a great encampment organized by them on a mountain near Prague in 1419, for the purpose of receiving the Communion in both kinds. On the same spot they founded the city of Tabor, and, assembling an insurrectionary force, marched on Prague under the lead of Ziska (July 30, 1419), and committed great atrocities under the pretense of avenging insults offered to the Calixtine custom of communicating under both kinds. On the death of King Wenceslaus (Aug. 16, 1419) they began to destroy churches and monasteries, to persecute the clergy, and to appropriate church property on the ground that Christ was shortly to appear and establish His personal reign among them. They were eventually conquered and dis-

persed in 1453 by George Podiebrada (afterward King of Bohemia).

Tabriz, or **Tabreez** (the ancient Tauris), a city of Persia, capital of the province of Azerbijan, on the Aigi, 36 miles above its entrance into Lake Urumia. It lies at the inner extremity of an amphitheater, about 4,000 feet above sea-level, with hills on three sides, and an extensive plain on the fourth. It is surrounded with a wall of sun-dried brick, with bastions, and entered by seven or eight gates. There are numerous mosques, bazaars, baths, and caravanserais. The citadel, originally a mosque, and 600 years old, was converted by Abbas Mirza into an arsenal. The blue mosque dates from the 15th century. Tabriz has manufactures of silks, cottons, carpets, leather and leather goods, etc. It is the great emporium for the trade of Persia on the W., and has an extensive commerce. It has frequently suffered from earthquakes. Pop. 180,000.

Tabula, in Roman antiquity, a table or tablet, especially a writing table; hence popularly a legal instrument or record. In anatomy and zoölogy, it is a hard, flat expansive surface as of bone. Specifically, in corals, a dissepiment; one of the high developed and usually transverse or horizontal partitions which cut the septa, when present, at right angles, forming a set of floorings or ceilings of certain cavities.

Tabula Rasa, a term used by the Sensasational philosophers of the 17th century to describe the condition of the human mind before it has been the subject of experience, in opposition to the supporters of the theory of innate ideas. The origin of the expression is probably to be found in Aristotle.

Tabular Differences, in logarithmic tables of numbers, a column of numbers marked D, consisting of the differences of the logarithms taken in succession, each number being the difference between the successive logarithms in the same line with it. When the difference is not the same between all the logarithms in the same line, the number which answers most nearly to it, one part taken with another, is inserted. In the common table of logarithms the logarithms of all the numbers from 1 to 10,000 can be found by inspection, but by the aid of the tabular differences the logarithms of numbers between 10,000 and 1,000,000 may be found. Also by the aid of the same differences the number corresponding to any logarithm can be found to five or six places. In logarithmic tables of sines, tangents, secants, cosines, cotangents, and cosecants there are three columns of tabular differences on each page. The first of these is placed between the sines and cosecants, the second between the tangents and cotangents, and the third between the secants and cosines. These numbers are the differences between the logarithms on the left hand against which they are placed and the next lower increased in the proportion of 100 to 60. The use of these differences is to facilitate the finding of the logarithmic sine, tangent, secant, etc., for any given degrees, minutes, and seconds, or the degrees, minutes, and seconds corresponding to any given logarithmic sine, tangent, secant, etc.

Tabular Spar, or **Table Spar,** called also WOLLASTONITE, in mineralogy, a silicate of lime, generally of a grayish-white color. It occurs either massive or crystallized, in rectangular four-sided tables, and usually in granite or granular limestone, occasionally in basalt or lava.

Tabulata, in zoölogy, a group of Madreporaria Perforata. Tabulate corals, having the visceral chamber divided into stories by tabulæ, and with the septa rudimentary or absent. The group is of doubtful stability, some recent genera, as *Millepora, Heliopora,* etc., having been removed from it, and various fossil genera *Favosites, Chætetes, Syringopora, Halysites,* etc., being placed in it provisionally. Families, *Favositidæ, Chætetidæ, Thecidæ,* and *Halysitidæ.* From the Silurian onward.

Tacahout, or **Tacout,** the name of small, irregularly-rounded, tuberculate galls produced by a species of cynips on the twigs of a tamarix (probably *T. articulata*) in Algeria and Morocco. They contain a large quantity of gallic acid, and are imported for use principally in photographic preparations. The above-named species of tamarix, as also *T. gallica* and *T. dioica,* supply a similar gall in India — the mahi of the Punjab and sakun of Sindh — which is collected for sale and used as a mordant in dyeing and in tanning.

Tacamahac, the name given to a bitter balsamic resin, the produce of several kinds of trees belonging to Mexico and the West Indies, the East Indies, South America, and North America. The balsam poplar or tacamahac is one of these. See also CALOPHYLLUM.

Tacca, a tropical genus of monocotyledonous herbs, some of whose species have a large tuberous root; *e. g.,* the *T. pinnatifida,* a plant of the shores of the South Sea Islands. Its tubers, which resemble new potatoes, contain a large proportion of starch, and this being separated by rasping and maceration, is largely used as an article of food. It bears the name of South Sea, Tahiti, and Fiji arrowroot, and Otaheiti salep, and is also esteemed as a medicinal agent in dysentery and diarrhœa.

Taccaceæ, in botany, taccads; an order of endogens, alliance Narcissales. Large perennial herbs with a tuberous root. Leaves radical, stalked, exstipulate, undivided or pedatifid, the segments pinna-

tifid and entire, with curved parallel veins. Flowers at the extremity of a scape, in umbels, surrounded by undivided bracts, constituting an involucre. Perianth six-cleft, the tube superior, the limb petaloid, equal or unequal; stamens six, persistent, with dilated filaments; styles three, connate; ovary of three carpels, with five parietal placentæ; many-seeded; fruit baccate, with lunate striated seeds. Known genera, two, species eight; found in damp forests, especially near the sea in tropical India, Africa, and the South Sea Islands.

Tache, a pan in a battery of sugar-pans. The term is, however, often especially applied to the smallest of the five; that immediately over the fire, from which the concentrated juice is transferred to the cooler, also called the striking tache.

Tachina, in entomology, the typical genus of *Tachinariæ*. One of the largest species is *T. grossa*, found in Europe. It is two-thirds of an inch long, black, and covered with bristles, the head and the base of the wings reddish yellow.

Tachinariæ, in entomology, a group of *Muscidæ*. Bristles projecting from the third joint of the antennæ, either entirely naked or hairy, or plumose only at the base. Scales behind the base of the wings very large, entirely concealing the halteres. Flies with hairy bodies, moderately stout, and flying with great rapidity. The larvæ feed as parasites on caterpillars of the lepidoptera and sawflies, also on beetles, field bugs, earwigs, grasshoppers, bees, wasps, and spiders. They are abundant in all parts of the world.

Tachinidæ, a family of *Brachelytra*, now merged in *Staphylinidæ;* small, excessively agile beetles of convex tapering form, with pentamerous tarsi. They frequent flowers.

Tachinus, in entomology, a genus of *Staphylinidæ*, with antennæ thickening insensibly, and somewhat pear-shaped, the palpi filiform, the legs spinous.

Tachometer, an instrument for measuring velocity; specifically: An instrument for measuring the velocity of machines by means of the depression occasioned in a column of fluid by centrifugal force, which causes the fluid in the cistern (with which the graduated column is connected) to sink in the center more and more with every increase of velocity. Thus the graduated column falls on the scale as the velocity is augmented, and rises as the velocity is diminished. Also an instrument for measuring the speed of flowing liquids. One form has several spiral vanes on a shaft carrying an endless screw, which turns a series of geared wheels. On being placed in a current, the vanes assume a position perpendicular thereto, and their rotation actuates the clock-work mechanism which is graduated to indicate the velocity of the liquid in miles per hour, or other units of measurement.

Tachydrite, a very deliquescent salt, resembling carnallite, which occurs in roundish masses of a yellow color in the compact anhydrite of Stassfurt. It has a hydrated chloride of calcium and magnesium.

Tachylite, in mineralogy, a kind of isopyre of a velvet-brown or black color, found on the Säsebühl, near Dransfeld, forming small masses in basalt and wacke. It is a silicate of alumina and protoxide of iron. The name has reference to its rapid fusibility.

Tacitus, the historian, is known to us chiefly from autobiographical touches in his own writings and from allusions in Pliny's

TACITUS.

letters. His full name is matter of doubt — Cornelius Tacitus being his nomen and cognomen; but whether his prænomen was Publius or Gaius can only be conjectured. Born perhaps in Rome (less probably in Terni), under the Emperor Claudius between A. D. 52 and 54, it is inferred that his family was respectable from his education, his profession, and his marriage. He studied rhetoric in Rome under M. Aper, Julius Secundus, and, likely enough, Quintilian; rose to eminence as a pleader at the Roman bar; and in 77 or 78 married the daughter of Agricola, the conqueror and governor of Britain. To this alliance he doubtless owed the accelerated promotion which, beginning with a quætorship under Vespasian, made him prætor in A. D. 88, and a member of one of the priestly colleges. Next year he left Rome, probably for Germany, where, doubtless as governor, he must have acquired his knowledge of the features, natural and social, of the country; and he did not return till 93, when he found his father-in-law had recently died. He was an eye-witness of Domitian's reign of terror, al-

Tacitus

most blaming himself, as a senator, for complicity in that monster's judicial murders of such exemplary citizens as Helvidius and Senecio, and we have his own testimony as to the blessed change wrought by the accession of Nerva and Trajan.

Under the former emperor he became consul suffectus, succeeding the great and good Virginius Rufus, on whom he delivered in the Senate a splendid *oraison funèbre*. In A. D. 99, conjointly with the younger Pliny, he prosecuted the political malefactor, Marius Priscus, and the "characteristic dignity" with which his share of the prosecution was conducted won him the thanks of the Senate. After this we lose sight of him, but may assume it as certain that he saw the close of Trajan's reign, if not the opening of Hadrian's. The high reputation he enjoyed in life is attested by the eulogistic mention of him repeatedly made in Pliny's letters, and in the 3d century the Emperor Tacitus, proud to claim kinship with him, built in his honor a tomb which was still standing in the later decades of the 16th century, when it was destroyed by Pope Pius V. The same emperor also issued an edict by which the works of his namesake were to be copied out 10 times yearly for presentation to as many public libraries.

In spite of this multiplication of copies we possess but a moiety of what he wrote. His earliest work, the "Dialogues de Oratoribus," treats, in conversational form, of the decline of eloquence following on the change for the worse in the education of the Roman youth under the empire. This, published in 76 or 77, was for some time suspected to be from another pen, but is now included in every edition of his works. It has reached us entire. Next comes the "Agricola," the literary character of which it is difficult to define. Quite a library has accumulated on the question whether it is a "laudatio funebris," or an "apologia" written to shield the memory of Agricola from the charge of servility, or a historical panegyric framed for political ends. As biography it has grave defects, while it cannot be brought under any of the three above-named heads without serious deductions. But it will always be read for its elevation of style, its dramatic force, its invective and its pathos. For English readers its interest is unique. The third work, the "Germania," or "De situ, moribus, et populis Germaniæ," is a monograph of the greatest value on the ethnography of Germany. Faulty in geographical detail, it becomes characteristically strong wherever human interest emerges. Fourth in order are the "Historiæ," or the history of the empire from the accession of Galba in A. D. 69 to the assassination of Domitian in 97. Of the 12 books originally composing it only the first four and a fragment of the fifth are extant.

Tacitus is at his strongest in this narrative. His material was drawn from contemporary experience; and though the imperial archives were closed to him, he had at command the personal information open to a man of his position, to say nothing of correspondence (as of Pliny), the "laudationes funebres," the "acta diurna" (what we should call the "gazette"), and the "acta Senatus," the Roman equivalent for Hansard. He had no sympathy with the empire, as indeed we gather from his earliest work. He yearned for the return of an aristocratic oligarchy — the Rome of the Scipios and the Fabii. He is, on this account, a partisan, but is able to justify the most trenchant contrasts between the greatness of Republican and the deterioration of Imperial Rome, which latter he contrasts disadvantageously with the freedom and simplicity of even barbarian Germany. To his peculiar satirical gift which often makes him a "Juvenal in prose" he gives free rein from time to time; though even in his bitterest moods he never forgets he is a Roman—a certain *chauvinism* betraying itself in his tendency to minimize the defeats of his compatriots and even the number of their slain. He had no appreciation of the higher qualities of the Jews, and his attitude to the growth of Christianity is that of a prejudiced, if cultured Roman, who, recognizing an overruling providence or supreme "Necessitas," will not stoop to weigh the evidence to which the new religion appealed.

The qualities conspicuous in the "Historæ" are maintained in his last work, the so-called "Annales," a history of the Julian line from Tiberius to Nero (A. D. 14 to 68). Of their 16 books only eight have come down to us entire, four are fragmentary, and the others lost. In these, as in all his writings, his avowed aim was a noble one, to perpetuate virtue, and to stigmatize baseness whether in word or deed. It is for its direct encouragement of the latter and persecution of the former that he constitutes himself so severe a censor of the imperial system; though he is not blind to the shortcomings of the later republic, under which the provinces, he admits, were worse off than under the empire. Among the more obvious defects which lower his value as a historian are his weakness in geography and his carelessness as to strategic details: he is, as Mommsen calls him, "the most unmilitary of authors," though Sallust or Livy run him hard. His style is the most strongly marked of antiquity — statuesque in outline, rich if somewhat too somber in coloring, effective in antithesis, not seldom obscure from sheer condensation. But the more trouble the reader takes with it the greater his reward.

Tacitus, Marcus Claudius, a Roman emperor; born in Terni, Umbria, about A. D. 200; was elected on the death of Aurelian, A. D. 275, when in his 75th year. He was descended from the great historian, and had been twice consul; but he reigned only six months, in which short space he displayed singular wisdom, vigor, and moderation. He was assassinated at Tyana, in Cappadocia, in 276.

Tack, in nautical language: (1) The lower forward corner of a fore-and-aft sail. (2) The lower, weather corner of a course, or lower square sail. (3) The rope by which the forward lower corner of a course or stay-sail is drawn forward and confined. (4) A rope by which the lower corner of a studding-sail is drawn outward and held to the boom. (5) Hence, the course of a ship in regard to the position of her sails; as, the starboard tack or port tack; the former when she is close-hauled with the wind on her starboard, the latter when close-hauled with the wind on her port side. To tack is to change the course of a ship by shifting the tacks and position of the sails from one side to the other; to alter the course of a ship through the shifting of the tacks and sails. Tacking is an operation by which, when a ship is proceeding in a course making any acute angle with the direction of the wind on one of her bows, her head is turned toward the wind, so that she may sail in a course making nearly the same angle on the other bow. This is effected by means of the rudder and sails. See TACKS.

Tackett, John Robert, an American physician; born near Water Valley, Miss., July 28, 1857; was graduated at Tulane University, La., in 1889, and later studied at the New York Polyclinic. He was a member of the Mississippi Valley Medical Association, assistant superintendent of the Mississippi Insane Asylum; commissioner to Havana, Cuba, to investigate the yellow-fever conditions for the State Board of Health in 1897; and acting assistant surgeon in the United States army in 1898. During the American-Spanish War he served in the Cuban and Porto Rican campaigns, and was in charge of the yellow-fever hospital near Santiago, Cuba.

Tacks. The process of manufacturing these small but highly essential articles is very interesting. The iron, as received from the rolling mills, is in sheets from 3 inches to 12 inches wide and from 3 feet to 9 feet in length, the thickness varying, according to the kind of work into which it is to be made, from one-eighth to one-thirty-second of an inch. These sheets are all cut into about three-foot pieces, and by immersion in acid cleaned of the hard outside flinty scales. They are then cut into strips of a width corresponding to the length of the tack required. The strip is then placed firmly in the feeding apparatus, and by this arrangement carried between the knives of the machine. At each revolution of the balance wheel the knives cut off a small piece from the end of this strip. The piece cut off is pointed on one end, and square for forming the head at the other. It is then carried between two dies by the action of the knives, and these dies coming together form the body of the tack under the head. Enough of the iron projects beyond the face of the dies to form the head, and, while firmly held by them, a lever strikes this projecting piece into a head. This is all done during one revolution of the balance wheel, and the knives, as soon as the tack drops from the machine, are ready to cut off another piece. These machines are run at the rate of about 150 revolutions a minute.

Tacna, a province formerly in the extreme S. of Peru, now in Chile; area, 8,688 square miles. On the E. it is separated from Bolivia by the Andes. Between these mountains and a coast range running through the province there is a rainless tract, but it is crossed by several streams that render the adjoining land fit for cultivation. The climate is hot and the region subject to earthquakes. Although there are deposits of silver and copper these mineral resources are not well developed. The capital is Tacna, situated in a fertile district that forms a great contrast to the arid wastes surrounding it. In 1880 Chile seized the S. portion of Peru, with which country it was then at war. In 1884 the two republics made a treaty containing the provision that after an occupation of 10 years by Chile, a plébiscite of the province should decide to which country it should ultimately belong. The government retaining the disputed territory was to pay for it an indemnity of $10,000,000. The decision was, however, delayed for several years. A convention relating to the plébiscite was signed at Santiago, April 16, 1898, but was rejected two years later by the Chilian House of Representatives.

Tacoma, a city of Washington, county-seat of Pierce co. It is situated in the W. part of the State, at the head of Commencement bay, a S. E. arm of Puget Sound, 23 miles S. by W. of Seattle, 25 miles N. E. of Olympia, and 118 miles N. by E. of Portland, Oregon. It covers an area of nearly 30.4 square miles, and had a population estimated in 1907 at 60,000. About 6 miles to the S. of the city are the so-called "Natural Parks," about 15 miles long and 10 miles broad, dotted with numerous lakes.

Topography, etc.—The city occupies a picturesque site on rising ground, commanding a superb view of the sound, the Cascade mountains, and Mt. Rainier, or Tacoma

(14,520 feet), 44 miles to the S. E., covered with glaciers and eternal snows. The Puyallup river empties into the bay within the municipal limits, its mouth forming a part of the fine natural harbor. The streets, aggregating over 120 miles in length, are broad and level. Pacific avenue is the principal business street. The best residence portion is on a plateau, 200 feet above the bay. The public parks embrace an area of 1,133 acres, the largest being Mount Defiance park (637 acres), largely covered with primeval giant firs.

Buildings and Institutions.—There are numerous substantial business blocks and public buildings, including the court house, city hall, Carnegie Library, St. Leo's Church (R. C.), opera house, chamber of commerce, offices of the Northern Pacific railroad, and other buildings. There are over 70 churches and numerous charitable institutions. Among the latter may be mentioned the City and County Hospital, St. Joseph's Hospital, the hospital of the Northern Pacific railroad, Fannie C. Paddock Memorial Hospital, Children's Home, and the State Insane Asylum, a few miles to the S. The public school system includes a high school, employs about 150 teachers, and affords instruction to some 8,000 pupils. Among the higher educational institutions are the University of Puget Sound (M. E.), incorporated in 1903, Whitworth College (Presb.), Pacific University (Luth.), Tacoma Academy, and Academy of the Visitation (R. C.). The Ferry museum, housed in the court house, contains an admirable collection of Indian baskets, domestic utensils, canoes, weapons of the chase and war, totems, etc., as well as objects of art and Oriental curios.

Industries.—Tacoma is the second industrial city of the State, ranking after Seattle. The leading industries are the smelting and refining of lead, lumber and planing mill products, cars and general shop construction and repair by steam railroad companies (in the shops of the Northern Pacific railroad), flour and grist mill products, and slaughtering and meat packing. Other important industries are the canning and preserving of fish, breweries, confectionery, carriages and wagons, saddlery and harness, printing and publishing, furniture, foundries and machine shops, structural ironwork, coppersmithing and sheet iron working, wooden shipbuilding, etc. The industries of the city are favored by the abundance of cheap fuel, consisting partly of coal and partly of the waste of the lumber mills. Nearly the entire coal output of the State is derived from the county of Pierce and the neighboring counties of King and Kittitas. There is also an abundance of electric power, generated from the Snoqualmie falls, to the N. The rapid growth of the city's industrial activities since 1890 is shown in the following:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1890	225	$7,227,000	3,658	$2,723,000	$5,172,000	$10,433 000
1900	381	8,147,000	4.347	2,356,000	7,389,000	12,029,000

The special United States Census of Manufactures of 1905 was confined to industries carried on under the factory system, to the exclusion of neighborhood industries and hand trades. Compared with the corresponding figures of the census of 1900, the results are shown in the following:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	174	$6,790,000	3,552	$1,955,000	$6,341,000	$10,301.000
1905	237	13,269,000	4,892	3,209,000	15,837,000	22,803,000
Per cent. increase	36.2	95.4	37.7	64.1	149.8	121.4

Commerce and Transportation.—Within a short time the city has become one of the leading ports on the Pacific coast. In 1906 its coastwise and foreign shipments included 7,657,213 bushels of grain, of which 7,242,687 bushels were wheat; 1,071,016 barrels of flour; 143,483 tons of coal; 141,542,492 B.M. feet of lumber; besides fish, cattle, fruit, and ores of copper, lead, silver, and gold. The foreign imports amounted in 1906 to $3,612,000, against $1,817,000 in 1895; and the foreign exports, $17,681,000, against $2,857,000 in 1895. The harbor is secure and spacious, with several miles of docks and wharves. Steamship lines connect with Seattle, Olympia, Victoria, B. C., and other ports of Puget Sound; with San Francisco and other California ports; and with Alaska, China, and Japan. There are 2 national banks, besides several State and private ones. The city is an important railway center, being situated at the junction of the Pacific and Cascade divisions of the Northern Pacific, of which it is a western terminus, and on the Great Northern, Canadian Pacific, and other railroads. An electric railway service is maintained within the city, as well as to Seattle and other near-by towns and points of scenic interest.

Administration, History, and Population.—The city is administered by a mayor, elected biennially, a unicameral council, and a comptroller, treasurer, and board of education popularly elective. Other officials are appointed by the mayor with the approval

of the council. The city owns and operates the water works and an electric lighting plant. The annual municipal expenditure is about $1,000,000, of which about $300,000 are for schools. The municipal debt stood in 1906 at $3,649,000.

The first settlement on the bay (Old Tacoma) dates from the erection of a sawmill in 1868. The settlement of New Tacoma, made in the following year, was chosen as one of the western termini of the Northern Pacific in 1873, was chartered a city in 1874, and became the county-seat in 1880. The two towns were consolidated in 1883, and in 1887 complete railroad connection was established with the East. Population, 1870, 73; 1880, 1,098; 1890, 36,006; 1900, 37,714; 1910 (census), 83,743. In 1900 the population consisted of 21,232 males and 16,482 females, and included 307 negroes, 79 Indians, and 858 Mongolians. The foreign born numbered 11,032, making 29.3 per cent. of the total, and included 3,429 Scandinavians, 1,743 English, Scotch, and Welsh, 1,651 Canadians, 1,424 Germans, and 714 Irish.

Taconic Mountains, a range of mountains connecting the Green mountains of western Massachusetts with the Highlands of the Hudson. The Taconic system, in geology, was named from the characteristic strata of this range, a metamorphic rock, believed to be older than the Silurian system.

Tactics, Military, the art of disposing and moving troops in presence of the enemy. Strategy merges into tactics as the enemy comes within striking distance, and tactics is sometimes defined as the strategy of the battlefield. Different terms are used for its various branches: grand tactics and maneuver tactics, for marshaling large masses of men on the battlefield; minor tactics, for the conduct of small bodies, such as advanced and rear guards, outposts, patrols, etc.; fighting tactics, for the combat whatever the numbers of the force; fire tactics, for the best use of guns and rifles, the massing of their fire, and the selection of the target; and the special tactics of cavalry, artillery, or infantry, siege tactics, etc.

It would be impossible to enumerate all the schemes and devices which go to make up this science, varying as they must with the arms in use and the maneuvering power of the troops employed, but some illustrations may be given, from ancient and modern history. In Judges xx. we read of a favorite and dangerous maneuver, the Israelites feigning to retreat before the Benjamites, so as to draw them on till their flanks and rear were exposed to the "liers in wait." Hannibal at Cannæ and William the Conqueror at Hastings were among the many successful imitators of these tactics. Others, like the Duke of Burgundy in 1476 at Granson, lost their armies through attempting it with unsteady troops. Frederick the Great owed his victory at Mollwitz to the rapid fire and steady discipline of his men, and the former was chiefly due to the introduction of iron ramrods. His later battles give us good examples of maneuver tactics. At Leuthen he engaged the Austrians, immovable in their chosen position, with his advanced guard, while his main body under cover of some hills and foggy weather marched in open column of companies round their flank, wheeled into line and rolled up their army. At Rossbach he showed how to defeat this maneuver when the enemy put it in practice. Sending his cavalry and artillery to check the head of their marching columns, he threw his main body on their flank and inflicted a crushing defeat. At Kolin his linear tactics failed because the rear of his column wheeled into line too soon, leaving the head to continue the march, so creating a wide gap in the line when formed up. At Waterloo Napoleon showed an example of combined tactics on a large scale. By cavalry charges he obliged the British infantry to form squares, which then became targets for his massed artillery. When under stress of this "hard pounding" they opened out into line, a renewed charge of cavalry obliged them to take the denser formation again. At Gravelotte the German armies (some 240,000 men) showed an unparalleled instance of grand tactics by marching to their positions across country in seven large masses, each consisting of one complete army corps. The minor tactics employed by advanced or rear guards and outposts are to a certain extent stereotyped. Their object is to prevent the main body — in the first case a column, often several miles long; in the second a large camp, cantonment, or bivouac — from being attacked before it can get into fighting order. Therefore a series of small parties of two to six men lead the way, or stand sentry, some four miles in front of the main body, while larger bodies support them at a little distance, followed in their turn by still larger units, so that the enemy meets with an ever-increasing resistance till he finds himself confronted by the main body drawn up in a carefully chosen position. Fighting tactics must depend chiefly on the arms in use. The mail-clad horsemen of the 15th century never succeeded in defeating the solid phalanx of pikemen opposed to them by the Swiss Confederation till the employment of artillery prevented the latter retaining such a massive formation. The English archer, protected in front by palisades and on the flanks by spearmen, destroyed the chivalry of France at Cressy and Poitiers, but at Bannockburn was ridden down by the Scotch cavalry, because the flanking spearmen had been omitted. Gustavus Adolphus, by employing cartridges, enabled his infantry to fire

Tactics

more quickly than his opponent and so to form on a wider front. The invention of the bayonet, doing away with the necessity for pikemen to protect the musketers, still further increased the fire-power of infantry. The British two-deep line overthrew, by its enveloping fire and charge, the column formation of the French in the Peninsula and of the Russians at the Alma, though in this battle its defects are shown in the confusion caused by moving to the attack over broken ground. In the battles of the Franco-German War of 1870–1871 it was found impossible to advance against the fire of modern breech-loading rifles except by rushes of comparatively thin lines of skirmishers, constantly reinforced by supports and reserves in rear. The magazine rifle and smokeless powder of today still further complicate the problem, presented to the assailant, of how to get to within 500 yards of the enemy without being destroyed. No rules can be laid down except that the attacker's first line must move in three portions, skirmishers, supports, and reserves, followed by a second line to assist in the assault, and a third to complete the success or cover a retreat.

In warfare against savages large numbers, fanatical courage, and rapid movements have to be met by special tactics. Thus the crescent-shaped enveloping attack of the Zulus and the rapid attacks of the Sudanese Arabs were received by the British in the impenetrable-square formation or by forming "laagers": a reproduction of the wagon tactics by which the Hussites of Bohemia defeated the German cavalry in the 15th century, opposing a material obstacle to the onslaught of an enemy unprovided with artillery. Thus, too, the Indians of the Western plains are met by a style of fighting resembling their own, and which the American troops also found serviceable in encounters with the Filipinos.

Cavalry tactics, apart from the exceptional use of dismounted men, are much the same as in the time of the Byzantine empire. Cavalry fight by shock action only, and the power of man and horse has not altered. The Byzantine turma, like the British cavalry brigade, attacked in two lines, with a reserve, flanking parties, and reconnoitering groups, maneuvering in column and attacking in line. Artillery tactics consist in massing the fire of every gun as soon as possible on important points, and overwhelming the enemy's guns and infantry with projectiles at ranges of two miles or more, not shunning closer quarters if the necessity arises.

Siege tactics belong to fortification, but follow the same general course as other combined tactics. Thus in defense the guns oblige early deployment and coöperate with the infantry in repelling the advance, while in the attack they destroy the material defenses and keep down the fire of the place so as to enable the assault to be delivered. During the siege mining tactics will be made use of on both sides. The functions of the cavalry are first to try to drive off the enemy's cavalry and effect reconnoissances on both sides; then on the attacker's side to complete the investment, and afterward secure the besieging troops against surprise.

Tactics, Naval, the art of maneuvering ships and fleets for the purpose of battle. Naval strategy, on the other hand, is the science of combining and employing fleets or single ships in order to carry out defined operations at sea or against an enemy's coast, for obtaining command of the sea or certain portions of it. Though fleets had existed and battles at sea been fought from the earliest periods, it was not till toward the close of the 16th century, in the reign of Queen Elizabeth, that naval war began to assume definite form. War at sea at this time does not appear to have been carried on on any definite plan, and consisted principally, if we except the attempt of the Great Armada, of raids on the enemy's commerce and coast towns. Perhaps the first organized attempt to obtain command of the sea as a distinct aim of the operations carried on are to be found in the three wars between the Dutch and English of 1652, 1665, and 1672. Both parties made desperate attempts to destroy the trade of the other, but in the second war Holland, considering the command of the sea the more important object, temporarily gave up her commerce, Dutch merchant ships being forbidden to put to sea. The net result of the three wars was to leave the honors pretty evenly divided between the two combatants. Several efforts were made by the French, between 1690 and their crushing defeat at Trafalgar, to obtain the command of the sea in order to effect the invasion of England. The first of these attempts, affording one of the best examples of the value of a thorough grasp of strategical principles, was foiled by the Earl of Torrington. An experienced seaman and profound strategist, the earl was forced against his better judgment, by direct orders from the queen and council, to attack the vastly superior forces under Tourville, and accordingly he gave battle (June 30, 1690)* off Beachy Head. He was defeated, but skillfully drew off and fell back under the shelter of the Gunfleet Shoals at the mouth of the Thames. Here, though "beaten, inferior, and shut up behind sandbanks," yet from the strategic position it now held this fleet still remained such a "power in observation" as to paralyze the action of the victorious and supe-

Tactics

rior force; and the French admiral, after some ineffective attempts at landing, returned to Brest. During the Napoleonic wars, the English fleets having more or less complete command of the sea, the strategy of the commanders seems to have resolved itself into blockade of the enemy where possible, or a close observation of his movements with a view to prevent any junction of his scattered forces; and if he ventured to put to sea, into efforts to bring him to action as soon as possible.

The line of battle consisted in a fleet of ships being extended in a straight line either ahead or abreast one ship of another, keeping as close together as weather permitted, so that at all times every ship should be ready to sustain and relieve one another. It was directed that each ship in the line should keep within half a cable's length (about 50 fathoms) of one another. It was introduced into the English navy by Sir William Penn. At the battle of the Nile (1798) Nelson doubled on the van of the French line and attacked it on both sides, while the other ships of the line, the whole fleet being at anchor, could afford no assistance; but at Trafalgar, where his brilliant career terminated with a decisive victory, he broke the enemy's line in two places, bearing down on it in two columns. Many persons even among naval officers have an idea that not only was Nelson no tactician, but that he despised tactics altogether; the real truth being that he was certainly the greatest tactician of his day. Before each of his great actions he had thoroughly digested and arranged the best disposition of his forces, having carefully considered every possible position in which the enemy could be found, and he made a point of discussing the different situations with his captains, so that they were all acquainted with his plans and knew what was expected of them.

Steam may be said to have revolutionized naval strategy and tactics; whereas the best-laid schemes were often frustrated by foul winds and gales, now the great steam power of battleships and cruisers renders them independent of wind and to a great extent of bad weather. As a set-off, however, to this, the coal endurance of ships and the replenishing of their supplies of fuel become important factors in deciding on their movements. On the question whether blockade is any longer possible the opinions of experts are divided; but the majority hold that blockade has become impossible, or is attended with so many risks as to make it highly inexpedient. The experience gained during the Civil War in the United States and the naval maneuvers of late years would seem to show that a perfectly effective blockade is out of the question; on dark nights or in thick weather vessels will almost certainly be able to slip out unobserved, and the danger of attacks from torpedo boats will prevent the blockading squadron from keeping very close in land. The blockading ships must always have their steam ready for full speed; this entails a large consumption of fuel, and after a few days tubes and fires require cleaning. If this is not done a great falling off of speed is the result; in addition to which allowance must always be made for the absence of ships which are recoaling and readjusting their machinery. The ships blockaded labor under no such disadvantages and have only to choose their own time for breaking out. Observation of the enemy's ports will therefore probably take the place of blockading; this being carried out by a chain of swift cruisers in touch with the main body of the fleet. The distance at which the main body should remain from the enemy's ports, and whether it should keep the sea or lie at anchor at some favorable base, are questions which the practical experience of war alone can solve. Steam and armor-plating have also revolutionized the conditions under which naval battles must be fought.

The battle of Lissa in 1866, was the first naval action in Europe to furnish any data under the new conditions of steam and armor-plating. The Italian fleet, consisting of 11 ironclads, four frigates, and some small vessels, was bombarding Lissa, when on the morning of July 20, 1866, the Austrian fleet was reported approaching. Persano, the Italian admiral, formed his ironclads in line of battle, standing to the N. E., nearly at right angles to the course on which the Austrians were advancing. Albini, his second in command, receiving no orders, fell back on a sort of general understanding that wooden ships should not unnecessarily engage armored ships, and, keeping well to the rear practically took no part in the action. Tegethoff, the Austrian admiral, advanced at full speed; his seven ironclads were formed in a double quarter line (a double oblique line), his flagship, the "Ferdinand Max," leading and forming the apex of the wedge. Following in the same formation, at a distance of about 1,000 yards, came seven wooden ships, an old line-of-battle ship, the "Kaiser," leading in the wake of the flagship; in rear of these again came seven gun vessels. Tegethoff's plans had been made and explained to his captains, and as he approached the enemy he made the signal "Ironclads to rush against and sink the enemy." For some reason at the last moment Persano, whose flag had been flying on board the "Rè d'Italia," determined to go on board the "Affondatore"; so he stopped for this purpose, and, as the van in the meantime held on their course, a gap was formed in the Italian line through which the Austrians passed, the Italian rear being at the

same time attacked by the Austrian wooden ships. Their center was exposed to the concentrated attack of the seven Austrian ironclads, so that, as the result of Persano's want of skill, with a fleet of 12 ironclads against seven, the actual condition of the fight was that three were opposed to the seven and annihilated by them, one, the "Rè d'Italia," being rammed and sunk, while another, the "Palestro," was blown up. Had Persano's subordinates been men of energy, in spite of the disaster to their center the Italian van and rear would have destroyed the Austrian wooden division. As it was, with the exception of the "Kaiser," the Austrian ships suffered but little.

The first real test of the ironclad as developed by modern naval science was given during the war between Japan and China, in 1894. Each of the contending nations had navies, which, while small, included a couple of the best battleships and cruisers of the world. The only fault with such a test is that the Japanese were so much superior to the Chinese in the skill with which they maneuvered their ships that the battle cannot be taken as a wholly fair test. One thing sufficiently established was the effectiveness of the modern vessel of war and its death-dealing power. The battle lasted six hours. The Japanese lost no ships, while they destroyed seven of the Chinese fleet of 10 and put the others to flight. The Japanese loss was 200 men and that of the Chinese was six times as great. See CHINA: JAPAN.

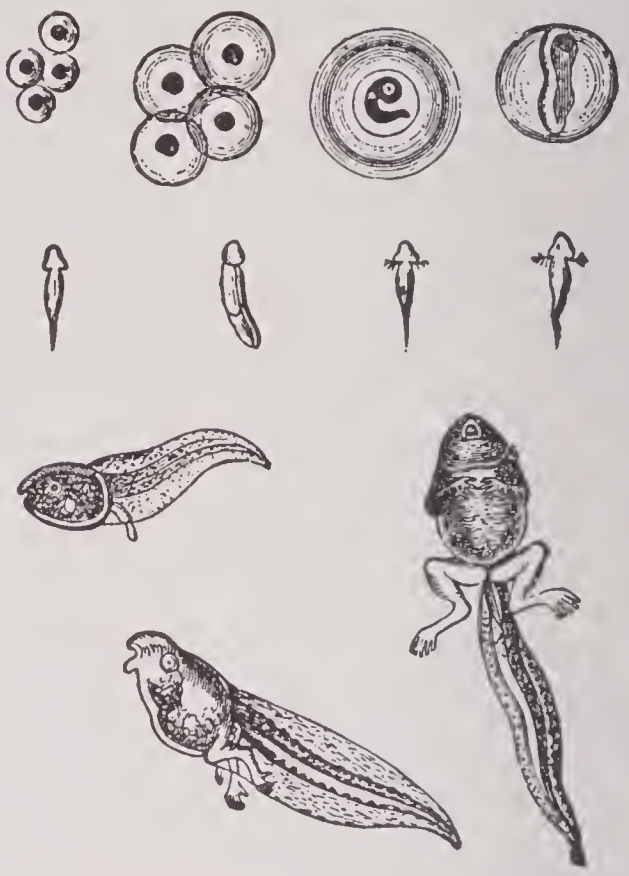
The Japanese-Chinese war, however, did not settle many of the great problems of marine warfare, and really proved nothing but the superior skill and prowess of the Mikado's subjects. Since then have been fought the most remarkable naval battles in history. See FLEET: MANILA BAY, BATTLE OF: SANTIAGO, NAVAL OPERATIONS AT.

Tactile Corpuscle, in anatomy, one of the three kinds of sensory terminal organs. They were discovered by R. Wagner and Meissner. They are mostly of oval form, nearly one three-hundredth of an inch long, by one eight-hundredth thick. They have a core of soft homogeneous substance within, and a capsule of connective tissue with oblong transverse nuclei, like miniature fir cones, outside. They exist in certain papillæ in the skin of the hand and foot, on the fore-arm, and the nipple. Called also touch bodies.

Tadema, Alma-. See ALMA-TADEMA.

Tadorna, in ornithology, a genus of *Anatidæ*, with seven species, from the palæarctic and Australian regions. Beak about as long as the head, under mandible much narrower than upper, nail decurved, forming a hook, mandibles with transverse lamellæ; nasal groove near base of beak; nostrils, oval, lateral, pervious; legs moderate, tibia naked for a little above the tarsal joint; toes three in front entirely webbed, one behind free; wings of moderate length. The sexes are nearly alike in plumage.

Tadpole, the larva of the anurous amphibia, sometimes so far extended as to include larvæ of the urodela, which undergo



METAMORPHOSIS OF A TADPOLE.

a much less complete metamorphosis. At first the young have no respiratory organs or limbs. They are all head and tail with simple entire gills which soon disappear, to be followed by others of more complicated structure, situated within the cavity of the body as in fishes. After a certain length of time the hind legs begin to appear, the head becomes more developed, and the body assumes a more compact form. Still later the forelegs are found to exist fully formed beneath the skin and ready ultimately to burst forth. The tadpole at first seems to derive its subsistence from the fluid absorbed within its body and on the surface, but soon begins to seek its food amidst softened or decomposing vegetable matter. From that period the tadpole begins to assume more and more the appearance of a frog. Toes appear on its hind legs, the tail very rapidly disappears by absorption, and finally the forelegs become fully developed and the metamorphosis of the tadpole is completed.

Tadpole Hake, in ichthyology, the *Raniceps trifurcatus,* from the coasts of Northern Europe. It is a small fish, about 12 inches long, and of a darkish-brown color, somewhat rare, but occasionally taken on the Scotch coast and round Devon and Cornwall. The head is disproportionately

large and broad, a circumstance which has given rise to its popular name. Called also the trifurcated hake, Tommy noddy, and the lesser fork-head.

Tael, a money of account in China, the value of which varies considerably according to locality and the rate of exchange. On Oct. 1, 1901, it was worth in different localities from $0.639 to $0.704 in American gold. The haikwan or custom house tael is used by foreign nations in computing values, and on Oct. 1, 1901, was worth $0.704. The tael is also a definite weight, equal to 1.208 ounces troy.

Tænia, or **Tenia,** in architecture, the band or fillet surmounting the Doric epistylium. In surgery, a ligature; a long and narrow ribbon. In zoölogy, the tapeworm; the typical genus of *Tæniada*, consisting of internal parasitic worms, having an elongated, compressed, jointed body. The head is in general broader than the neck, with four suctorial depressions, and generally also a median retractile rostellum, frequently armed, especially when young, with one or two circles of minute recurved hooks. The genital organs at the margins of the joints, either on one side only or on both margins and on alternate joints. The species which are very numerous, Rudolphi admitting 146 and Dujardin 135, are most common in birds, next in mammalia, then in fishes, and lastly in reptiles.

Tæniada, cestoid worms; an order of *Plathelmintha* or *Scolecida*, containing the tapeworms and bladder worms. Internal parasites, hermaphrodite when mature. The body is elongated and consists of a head with many flattened articulations. The small narrow head or scolex contains nearly all the organs of the body, and is essentially the animal, the articulations, called metameres or proglottides, being generative segments thrown off by the head in the manner called budding or "gemmation." Each reproductive joint contains both male and female organs. The joints nearest the head are the newest, those farthest from it are the most mature. The anterior end of the body, or forepart of the scolex, is provided with suckers, hooks, or foliaceous appendages, or with all three combined. There is no mouth or alimentary canal, so that it must derive materials for its nourishment only by absorbtion through the skin. The nervous system seems to consist of two small ganglia, sending filaments backward. There is a water-vascular system. The whole animal is called a strobilus. After a time some of the metameres break off the worm still continuing to grow. They continue to live till the ova are expelled. The numerous eggs which they contain ultimately rupture the tissue and escape after being voided with the evacuations of the person or animal in whose intestinal canal they were. The eggs are swallowed in water, or with grass and other herbs, and obtain a nidus for development in a new individual. The larvæ are oval, and have three pair of hooks arranged in bilateral symmetry. Besides the cestoid sexual forms, there are cystic asexual conditions of many *Tæniada*.

Tæniocampa, in entomology, a genus of *Orthosidæ*. Antennæ ciliated or pectinated in the male; abdomen smooth, a little depressed; fore wings entire, thick, powdery; wings in repose forming a very sloping roof. *T. gothica* is the Hebrew character moth.

Tæniopteris, in botany, an exotic genus of *Tænitideæ*. In palæobotany, a genus of ferns with broad, ribbon-like fronds, simple or pinnate, secondary nerves running at right angles from the primary; fructification linear, the approximately parallel lines placed at the margin of the secondary veins. Seven species — one doubtful.

Tænite, a name given to an alloy of iron and nickel found in certain meteoric irons, having the probable formula, Fe_4Ni_3.

Tænitis, in botany, the typical genus of *Tænitideæ*. Sori submarginal in the middle of the disk of the leaf, linear, elongate, and continuous; veins anastomosing more or less regularly into meshes.

Tæniura, in ichthyology, a genus of *Trygonidæ*, closely allied to the type genus. There are six genera, from the East Indian seas and the fresh waters of tropical America.

Taeping. See TAIPING.

Taffety, or **Taffeta** (Persian, *tâfta*), a term formerly applied to all plain silks simply woven by regular alternations of the warp and weft. Modifications have, however, been introduced, by varying the quality of the warp and weft and by the substitution of various colors for the single one of the original taffety. It has therefore become a sort of generic term for plain silk, and even for some combinations of silk, wool, etc.

Taffrail, originally the upper flat part of a ship's stern, so called because frequently ornamented with carving or pictures; now a transverse rail which constitutes the uppermost member of a ship's stern.

Tafia, or **Taffia,** in the French West Indian Islands, an inferior variety of rum distilled from molasses.

Tafilelt, or **Tafilet,** a large oasis in the Sahara of Morocco. The chief place is Abuam.

Taft, Alphonso, an American jurist; born in Townshend, Vt., Nov. 5, 1810; was graduated at Yale University; admitted to the bar in 1838; settled in Cincinnati, O.; and there became eminent in his profession. In 1856 he was a member of the Republican National Convention and also a candidate

for Congress, but was defeated by George H. Pendleton. He was judge of the Cincinnati Superior Court in 1866-72; was appointed secretary of war March 8, 1876; served in that capacity till May 22 of the same year; and was then made attorney-general. He was United States minister to Austria in 1882-84, and to Russia in 1884-85. He died in San Diego, Cal., May 21, 1891.

Taft, William Howard, an American statesman and 27th President of the United States; son of Alphonso Taft; born in Cincinnati, O., Sept. 15, 1857; was graduated from Yale in 1878, from the Law School of Cincinnati College in 1880, and was admitted to the bar in 1881. He was collector of internal revenue in the 1st district of Ohio in 1882; practised law in 1883-87; was judge of the Superior Court of Ohio in 1887-90; and solicitor-general of the United States in 1890-92. From 1892 to 1900 he was United States circuit judge, 6th circuit (Kentucky, Michigan, Ohio, Tennessee), and from 1896 to 1900 dean of, and professor in, the law department of the University of Cincinnati. In 1900-03 he was president of the Philippine Commission, and on June 5, 1901, became the first civil governor of the Philippine Islands (*q. v.*) In 1902 he went to Rome as special delegate, appointed by President Roosevelt, to confer with Pope Leo XIII. regarding the purchase of lands held by Roman Catholic orders in the Philippines. After efficient service in the difficult post of governor, he resigned in 1903, and on Feb. 1, 1904, succeeded Elihu Root as secretary of war, continuing the programme of army reorganization. During the absence abroad of Secretary Hay in April and June, 1905, he also directed the affairs of the Department of State. In July, 1905, he headed a party of senators and representatives that visited the Philippines to collect information regarding political, commercial, and industrial affairs.

In August and September, 1906, Taft represented the United States in Cuba (*q. v.*), inaugurating a provisional government, and in 1907 he visited the island again. On October 16 of that year he opened the Philippine Assembly. During this visit to the East he was welcomed at Shanghai, China, and had an audience at Tokyo, Japan, with the Mikado, as a result of which Japanese irritation against the United States was somewhat allayed. On Dec. 3, 1907, he delivered at St. Petersburg, Russia, a noteworthy address on peace. After his return from this journey around the world, he became prominent among those most mentioned for the next presidency. His candidacy was earnestly urged by President Roosevelt, many Republican State conventions indorsed it, and he was nominated by the Republican national convention at Chicago, June 18, 1908. On June 30 he resigned as secretary of war. He was elected president Nov. 3, 1908, receiving 321 electoral votes against 162 for William J. Bryan, the Democratic candidate. After the election he spent much time in the South, arousing fresh interest among the people in national questions. In January and February, 1909, he inspected the work on the Panama Canal, reporting satisfactory progress, and on March 4 he was inaugurated.

Tagalos, Tagalogs, or Tagals, the chief aboriginal Malay stock of the Philippine Islands (*q. v.*).

Taganrog, a seaport of Russia, in the province of the Don Cossacks, on the N. shore of the Sea of Azov; 18 miles N. W. of the mouth of the Don. The harbor has become shallow, and trade has decreased, but there is much export of wheat, skins, wool, butter, etc. Pop. (1900), 60,678.

Tagbanuas, a Philippine people inhabiting the Calamianes and the island of Palawan.

Tagbilaran, a town in the Philippines, capital of the province of Bohol; situated on the S.W. coast of Bohol Island. Separated from Bohol Island by a strait one mile wide is the island of Panglao. Agriculture and turtle fishing are carried on by the inhabitants. Pop. (1903), 10,108.

Taglioni, Maria (täl-yō′nē), a Swedish ballet dancer; born in Stockholm, Sweden, April 23, 1804. Her parents were Italian, her father (Filippo Taglioni, born in Milan, 1777; died 1871) having been successively ballet-master at several opera houses in different parts of the Continent. She made her début in Paris in 1827, where she created a perfect furore, and was at once recognized as the first of ballet dancers. Her success was equally great at Berlin, London, and other European capitals. She married Count de Voisins in 1832, and retired with a fortune, afterward lost. She died in Marseilles, France, April 23, 1884.

Taguan, a large Asiatic and East Indian flying squirrel, *Pteromys petaurista*. During the day it sleeps in holes in trees, but at night it comes forth, climbing and leaping with great rapidity. In its short flights from tree to tree its tail serves as a sort of rudder.

Tagus, the largest river in the Spanish peninsula, which, rising between the Sierra de Albarracin and the Sierra Molina, on the frontier of Aragon and New Castile, flows S.; then, holding a W. course through the rest of Spain, enters Portugal, when, pursuing a more S. direction, it passes Lisbon, forming the magnificent harbor of that city, and enters the Atlantic by a splendid estuary, after a course of 560 miles. Above the capital of Portugal it has a width of 5 miles; at the city a breadth of 2 miles; but, in consequence of its deep banks and

impetuous current, the Tagus is but little adapted to mercantile purposes and is at present only navigable to Abrantes.

Tahiti, an island giving name to a small archipelago, also called SOCIETY ISLANDS, (*q. v.*), in the middle of the Pacific, more than 2,000 miles N. E. of New Zealand and some 3,400 S. S. W. of San Francisco.

Tahoe, Lake, a beautiful body of water at the base of the Sierra Nevada Mountains, on the boundary line between Placer co., Cal., and Douglas and Ormsby cos., Nev. It is about 20 miles long and 12 miles wide, and about 6,250 feet above sea-level. The scenery about it is strikingly picturesque. Its outlet is the Truckee river.

Tahr, the *Capra jemlanica* or *jemlaica,* a wild goat, found on steep tree-covered slopes along the whole range of the Himalayas from Kashmir to Bhutan. The horns are about a foot long, flattened, with a notched anterior margin; body fawn-brown, hair of neck, chest, and shoulders, reaching to the knees. Female lighter in color with smaller horns.

Taiguic Acid, an acid obtained from taigu by treating with cold alcohol. It crystallizes in oblique, yellow prisms, tasteless and inodorous, slightly soluble in water, soluble in alcohol, ether, and benzene, melts at 135° and sublimes at 180°.

Tail=block, in navigation, a block whose strap is prolonged into a tail which is tapered, or the ends may be twisted into foxes and plaited together like a gasket. Blocks used for jiggers have a double tail made in the same manner.

Taillandier, Alphonse Honoré (tī-*ong*-dyā′), a French law writer; born in Paris, France, in 1797. His principal works are: "Collection of Ancient French Laws from the Year 420 to the Revolution of 1789" (23 vols. 1821–1830); "Reflections on the Penal Laws of France and England" (1824). He died in Paris in 1867.

Taillandier, René Gaspard Ernest, usually styled SAINT-RENÉ TAILLANDIER, a French historian and biographer; born in Paris, France, Dec. 16, 1817. He was appointed Professor of French Poetry in the Sorbonne 1863. Among his works are: "Scotus Erigena and the Scholastic Philosophy" (1843); "Studies on the Revolution in Germany" (1853); "The Countess of Albany" (1862); "Maurice de Saxe" (1865); "Ten Years of the History of Germany" (1875); "King Leopold and Queen Victoria" (1878). He died in Paris Feb. 24, 1879.

Taillepied, Noel (tī-pyā′), a French historical writer; born in Normandy in 1540. His principal works are: "Abridgment of the Philosophy of Aristotle" (1583); "History of the State and Commonwealth of the Druids" (1585); "Collection of the Antiquities and Curiosities of the City of Rouen" (1857); "Treatise on the Apparition of Ghosts" (1602). He died in Angers in 1589.

Tailliar, Eugène François Joseph (tī-är′), a French law writer; born in Douai in 1803. Among his writings are: "Essay on the History of the Institutions of Northern France in the Celtic Era" (1852); "Usages and Ancient Customs of the County of Guysnes" (1856); "Essay on the History of Institutions" (1859). He died in Douai July 8, 1878.

Tailor Bird, the *Orthotomus sutorius,* a small bird about six inches long; general color olive greenish; wings brown, edged

TAILOR BIRD.

with green; crown of the head rufous, inclining to gray on the nape; tail light brown; outer feathers narrowly tipped with white; under surface of the body white; legs flesh-colored. The male has the two center tail-feathers lengthened. A native of India, the Eastern Peninsula, China, etc. It is found in gardens, hedgerows, orchards, jungles, etc., sometimes in pairs, sometimes in small flocks, feeding on ants, cicadellas, and other small insects. Its name of tailor bird is derived from its nest, which is enclosed in leaves sewn with cobwebs, silk from cocoons, thread, wool, and vegetable fiber. The nest itself is formed of cotton-wool with fine loose hairs, etc. Eggs three or four; in different nests they are of different colors, some being white, spotted with rufous or reddish-brown, others bluish-green.

Tail=piece, a piece at the end, as of a series of engravings; an appendage. Also a piece of ebony or other material appended to the end of a violin or other similar instrument, to which the strings are fastened. In printing, tail-pieces are ornaments in wood or metal placed in short pages, partly to fill up the vacancy.

Taimyr (tī′mēr), a peninsula of Northern Siberia, extending into the Arctic Ocean, between the mouth of the Yenisei and Khatang Gulf, and containing Cape Chelyuskin, the most N. land in Asia.

TAIL-PIECE.

Taine (tān), **Hippolyte Adolphe,** a French writer; born in Vouziers, Ardennes, France, April 21, 1828; was educated at the

HIPPOLYTE A. TAINE.

Collège Bourbon and the Ecole Normale. In 1854 his first work, an "Essay on Livy," was crowned by the Academy; in 1864 he was appointed professor in the School of Fine Arts in Paris; and in 1878 he was elected to a seat in the Academy. His "History of English Literature," one of the best and most philosophical works on the subject, appeared in 1864 (4 vols.); his "Philosophy of Art" in 1865; his "Notes on England" in 1872; and his "Origins of Contemporary France" in 1875–1884, the last a work of great research and value in two sections, the first dealing with the Ancient Régime, the second with the Revolution. He died in Paris March 5, 1893.

Tainter, Charles Sumner, an American inventor; born in Watertown, Mass., April 25, 1854; was the inventor of the graphophone, and an associate inventor of the radiophone, an instrument for transmitting sounds to a distance through the agency of light; and was a member of the United States expedition to the South Pacific to observe the transit of Venus in 1874. He received a gold medal at the Electrical Exhibition in Paris in 1881 for his inventions in connection with the radiophone, and in 1899 was given the French Academy's decoration "Officer of Public Instruction" for the invention of the graphophone.

Taipings, the name given by foreigners to the followers of Hung Hsiû-ch'wan (S'eiw-tscuen), who raised the standard of rebellion in China in 1851, and whose enterprise was finally suppressed in 1865. Had it proved successful the account of it would have occupied a large space in the history of the country.

The leader Hung was born in 1813 in a poor agricultural village of the district of Hwâ, in Canton province. His only chance of rising in the world being by literary distinction, he became a diligent student, but he never succeeded in taking the first degree at the provincial capital. Through his visits to Canton, however, he had obtained a bundle of Christian tracts, and gained, it is believed, some knowledge of foreign missions. Returning home from another disappointing competition in 1837, he fell into a long illness in which he saw visions, and conceived the idea of changing the religion of the empire and subverting the ruling Manchâu dynasty.

When he got better he began to disseminate his new views, and could soon boast of two converts. These were like himself teachers of village schools who by-and-by lost their pupils and came into angry collision with their neighbors. In 1844 in company with the elder of the two converts, Hung went into the adjacent province of Kwang-hsî, where they made many converts, and gathered them into communities which they called "Churches of God." Hung began also to give forth arrangements and decrees as revelations communicated to him by "the Heavenly Father," and the "Heavenly Elder Brother." The Heavenly Father was "the Great God," and the Elder Brother was "our Lord Jesus Christ." Meanwhile progress of organization proceeded. A strictly moral conduct and the keeping of the Sabbath were enjoined on the congregations; all idolatrous practices and the use of opium were forbidden; proffers of union from leaders of the Great Triad Society, pledged to the restoration of a native Chinese dynasty, were rejected.

After some years of uncertain struggle with the official authorities, the insurgents (for such they were now) took possession of the district city of Yung-an. There they

hailed their leader as emperor of the dynasty of Taiping (Grand Peace), and adopted T'ien Kwo (Kingdom of Heaven) as the name of his reign. He was himself also styled T'ien Wank (Heavenly King), and some half a dozen of his oldest and most trusted followers were appointed by him his lieutenants, with the title of Wang (kings). After being kept for some time in a state of siege in the city by their opponents, on the night of April 7, 1852, they burst forth, scattered their besiegers, and commenced their march to the N. Their number was only a few thousands and they had no artillery, but full of enthusiasm they pressed on. We can only account for their success by recognizing the unpreparedness and supine cowardice of the imperial officers and their troops. They passed from Kwang-hsî into Hû-nan, got command of the Hsiang river, and before the end of the year had reached the great Yang-tsze river. Launching forth on it, and taking on the way the capitals of Hû-pei and An-hûi, they encamped before Nanking on March 8, 1853. Within 10 days it had fallen into their power, and every man of the Manchâu garrison been put to the sword.

Their host, grown in the 12 months from under 10,000 probably to more than 100,000, proclaimed the Taiping dynasty anew, and swore fealty to the heavenly king. In a few months a large force was dispatched N. to terminate the contest by the capture of Peking. This expedition did wonders, traversed the two provinces of An-hûi and Ho-nan, then marched W. to Shan-shî, from which, turning E. again, it penetrated into Chih-lî and finally occupied an entrenched position only about 20 miles from Tientsin. But the rebellion had there reached the limit of its advance. Though the expedition met with no great defeat, sufficient reinforcements did not reach them and the leaders were obliged to retreat toward Nanking in 1855.

From this time the rebel cause began to decay. The moral enthusiasm which had distinguished it in Kwang-hsî disappeared. Dissensions arose between the kings, who strove and fought among themselves and passed from the stage one after another. Hung created new kings to supply their places, but his name had ceased to be a word to conjure with. He secluded himself from public view, and was unable to institute any system of good order or administration in the extensive provinces subject to his control. The promise of Christian institutions died away. The imperial government, moreover, rallied its forces, and a desperate struggle ensued between them and the rebels. Some of the new kings proved to be men of great ability. Sû-châu and Nang-châu, the capitals of Chiang-sû and Chih-chiang, were both reduced and held by them for a time.

How the struggle would have ended was still uncertain, when the imperialists began to call in the assistance of foreigners. A body of men of different nationalities entered their service under an American, Frederick T. Ward. He was a very capable man, and did the imperialists good service till he was killed in 1862. Then the British authorities at Shanghâi were prevailed on to organize a more effective force, and to put the whole auxiliary movement under the direction of Col. Charles ("Chinese") Gordon. The Taipings fought with the courage of despair, but they could not long protract the final issue. Nanking was invested by the imperialists and taken at last on July 19, 1864. Hung himself, it is supposed, had taken poison a few weeks before and so escaped capture. His son, a lad of 16 years, fled under the protection of two of the kings, but they were all three soon taken and executed. What remnants there were of the fighting men made for the S. in different bodies, but they gradually melted away, and were finally extinguished in Canton province in the following year. See GORDON, CHARLES: WARD, FREDERICK TOWNSEND.

Tait, Archibald Campbell, Archbishop of Canterbury; born in Edinburgh, Scotland, Dec. 22, 1811; was educated at the Edinburgh Academy and Glasgow University, whence he passed as a Snell exhibitioner to Balliol College, Oxford. In due time he became fellow and tutor, and was one of the four tutors who in 1841 protested against Newman's "Tract 90." In 1842 he was appointed successor to Dr. Arnold as head master of Rugby, in 1849 became Dean of Carlisle, and in 1856 Bishop of London, as successor to Blomfield. Here he did much to bring the teaching of the Church home to the people, instituting evening sermons in St. Paul's, and encouraging open air preaching; while the "Bishop of London's Fund" for building schools, churches, and parsonages reached by his efforts the amount of $1,750,000. A friend of compromise, though a foe to needless innovations, he showed much tact and personal kindliness in dealing with various controversies as to vestments and confession; condemned the "Essays and Reviews," but promoted moderate measures; and though strongly hostile to Colenso's views, intervened to secure him fair play. The same love of the *via media*, which caused him now to be accused of bigotry and now of indifference, he manifested when (having declined the archbishopric of York in 1862) he was in 1868 made primate of all England by Mr. Disraeli. He assisted in composing the strifes raised by the question of Irish disestablishment, but was less successful with the Public Worship Regulation Act and the Burials Bill. He took a keen interest in missions, and greatly helped

to extend and improve the organization of the Church in the colonies. The Lambeth Conference of 1878 took place under his auspices. He lost in 1878 both his only son, the Rev. Craufurd Tait, and his wife, a daughter of Archdeacon Spooner, whom he had married in 1843; and he himself died Dec. 3, 1882. Among his many publications were: "The Dangers and Safeguards of Modern Theology" (1861), and "The Word of God and the Ground of Faith" (1863).

Tait, John Robinson, an American artist; born in Cincinnati, O., Jan. 14, 1834; was graduated at Bethany College, Va., in 1852, and studied art and painted in Florence, Italy, in 1853–1856, in Düsseldorf, Prussia, in 1859–1871, and in Munich, Bavaria, in 1873–1876. He was for several years the art critic of the New York "Mail and Express" and was the author of "European Life, Legend and Landscape," "Dolce far Niente" and papers on art in leading magazines. He died July 29, 1909.

Tait, Peter Guthrie, a Scotch physicist and mathematician; born in Dalkeith, Scotland, April 28, 1831; was educated at Edinburgh and Cambridge, where he was senior wrangler and first Smith's prizeman, and subsequently fellow of his college. In 1854 he was appointed Professor of Mathematics at Queen's College, Belfast, and in 1860 Professor of Natural Philosophy at Edinburgh. He was the joint author, with Prof. Sir William Thomson, of the well-known text-book, "Thomson and Tait's Natural Philosophy," and with the late Prof. Balfour Stewart of "The Unseen Universe." His "Heat" appeared in 1884, "Light" in 1884; "Properties of Matter" in 1885; "Scientific Papers" in 1898; and "Newton's Laws of Motion" in 1899. For his various mathematical and physical researches the Royal Society awarded him a medal in 1886. He died July 4, 1901.

Taiwan, the capital of the island of FORMOSA (*q. v.*), still under its Japanese masters a large trading city, on a plain about 3 miles from the S. W. coast; pop. estimated at about 70,000.

Tai-Yuen, a town of China, capital of Shan-si; on the Fuen-Ho, an affluent of the Hoangho, 250 miles S. W. of Peking. For many years the residence of the emperors, it is noted for its magnificent mausoleums. The chief manufactures are sword blades and knives. Pop. about 200,000.

Tajacu, or **Tajassu,** in zoölogy, the *Dicotyles torquatus* (Cuvier), *D. tajacu* (Linn.), the collared peccary, the smaller of the two species of the genus. It is about 36 inches long, dark gray in color, with a white or light gray band across the chest from shoulder to shoulder.

Taj Mahal, or **Mehal** ("Gem of Buildings"), a famous mausoleum, erected at Agra, India, by Shah Jehan for his favorite wife. It is 186 feet square with the corners cut off, and consists of two tiers of arches, with a single-arched porch in the middle of each side, the whole surmounted by a dome 58 feet in diameter and about 210 feet in height, flanked by four octagonal kiosks. The interior is divided into four domed chambers in the corners, and a large central arcaded octagon, all connecting by corridors. The central octagon contains two cenotaphs surrounded by a very noticeable openwork marble rail. The only light admitted enters through the delicately pierced marble screens of the windows. The

THE TAJ MAHAL.

decoration is especially noticeable for the stone mosaics of flower themes and arabesques, much of them in agate, jasper, and bloodstone. The entire structure stands on a white marble platform 18 feet high and 313 feet square, with tapering cylindrical minarets 133 feet high at the corners.

Tajurah Bay, an inlet of the Gulf of Aden into the African coast, on which is the small town of Tajurah and the dependency of Obock, now officially called French Somaliland.

Talaria, the small wings attached to the ankles of Hermes, or Mercury, in representations of that deity. They sometimes appear as growing to the ankle, more commonly as attached to sandals, one on each side of each ankle.

Talaut, or **Salibabo Islands,** a group of small islands S. E. of the Philippines. They are under Dutch control.

Talavatchi, a subtle poison, of which the constituents are unknown, formerly manufactured by the Aztecs, and by them handed down to their descendants, the Mexican Indians. Skillfully administered, it is said to destroy the mind while leaving slight effects on the body. It is said by some that the ex-Empress Carlotta, of Mexico, was poisoned by this drug at the hands of an Indian beggar, and that to this cause and not to grief at her husband's death, her insanity was due. Gen. Rudolph Gunner, a former intimate and official of Maximilian's court, is given as the authority for this statement. The peculiar effect of the poison seems to be to induce monomania or epilepsy, and sometimes both.

Talavera de la Reina (täl-ä-vā′rä dā lä rā-ē′nä), a picturesque town of Spain in the province of Toledo, beautifully situated on the Tagus, 75 miles S. E. of Madrid. It still manufactures pottery, and keeps up its famous fair in August. Here, on July 27-28, 1809, Sir Arthur Wellesley, with 19,000 men and 34,000 Spaniards, defeated 50,000 veteran French troops under Joseph Bonaparte and Marshals Jourdan and Victor.

Talbot, the name once given to a race of dogs, allied to or identical with the bloodhound. Also a race of hounds, nearly, if not quite extinct, which seem to have been kept for show rather than for use. Color pure white, large head, very broad muzzle, long pendulous ears, and rough hair on the belly. Talbot is the family name of the English house of Shrewsbury which has a talbot for badge and two talbots for supporters.

Talbot, Charles Remington, an American Episcopal clergyman and writer; born in 1851. His works include: "Honor Bright"; "Miltiades Peterkin Paul"; "Royal Louise"; "Romulus and Remus"; "A Midshipman at Large"; "The Impostor"; "A Romance of the Revolution." He died in 1891.

Talbot, Eugene S., an American dentist; born in Sharon, Mass., March 8, 1847; was graduated at the Pennsylvania Dental College in 1871; received the degree of M. D. from the Rush Medical College in 1880; and became Professor of Dental Surgery at the Woman's Medical College. In 1890 he was honorary president of the Dental Section at the 10th International Medical Congress in Berlin, and in 1897 was honorary president of the Dental Section at the 12th International Medical Congress in Moscow. His publications include: "The Irregularities of the Teeth and Their Treatment" (1888); "Osseous Deformities of the Head, Face, Jaws and Teeth" (1894); "Degeneracy: Its Causes, Signs and Results" (1898); "Irregularities of the Teeth" (1901); "Chart of Typical Forms of Constitutional Interstitial Gingivitis"; etc.

Talbot, John, Lord, an English military officer; born in Bletchmore in 1373. In 1414 he was appointed Lord-Lieutenant of Ireland where he suppressed a rebellion, and brought the chief, Donald Macmorrough, to England. In 1420 he attended Henry V. to France, and was present with him at his two sieges and triumphant entry into Paris. In the next reign he laid siege to Orleans, where his name struck terror into the French soldiers; but the appearance of Joan of Arc turned the scale and the English army retreated. The battle of Patai completed the disaster, and Talbot was made prisoner. At the end of three years and a half he was exchanged and again led the English to victory. He took many strong places, and carried his arms to the walls of Paris, for which he was created Earl of Shrewsbury. He was again sent to Ireland, and, on his return to France, he was marching to the relief of Chatillon, when his usual good fortune forsook him, and he and his son fell on the field of battle in July, 1453. The English on this occasion were wholly routed, and their expulsion from France soon followed.

Talbot, William Henry Fox, an English inventor and antiquary, celebrated in connection with photography; born in Lacock Abbey, near Chippenham, England, Feb. 11, 1800. He passed from Harrow to Cambridge, where he graduated as 12th wrangler and obtained the junior Chancellor's Medal in 1821. In the first reformed Parliament Talbot sat for Chippenham; but scientific investigation being more to his taste, he gave up politics and devoted himself to the problem of fixing shadows. Contemporaneously with Daguerre (about 1839), he discovered photography, which secured him a Royal Society medal in 1842. In 1841 he made known the calotype process discovered by him. Latterly he devoted himself to the study of general physics and to philological and miscellaneous researches, and was one of the first decipherers of the cuneiform inscriptions from Nineveh. His "Pencil of Nature" (1846), one of the first works illustrated by photographs, describes his great invention. Among his works are "Hermes, or Classical and Antiquarian Researches" (1838–1839); "Legendary Tales" (1830); "Antiquity of the Book of Genesis" (1839); and a work on English "Etymologies" (1846). He died in Lacock Abbey Sept. 17, 1877.

Talc, an orthorhombic mineral occurring in short hexagonal prisms and plates, also in globular and stellated groups, compact, massive. Cleavage, basal; hardness, 1 to 1.5; sp. gr., 2.565 to 2.8; luster, pearly; color, apple-green, white, shades of gray; sectile; feel, greasy. Composition, varying

with the amount of water present, but essentially a hydrated silicate of magnesia which, when pure, would contain: Silica, 62.0; magnesia, 33.1; water 4.9 = 100, the formula being $6MgO5SiO_2 + 2HO$. Dana divides as follows: (1) Foliated; (2) massive (steatite or soapstone); (*a*) Coarse granular, including potstone; (*b*) Cryptocrystalline (French chalk); (*c*) Rensselaerite, cryptocrystalline, but more often pseudomorphous; (*d*) Indurated, a very abundant mineral. Being thoroughly incombustible it is of great value in the manufacture of fireproof wall paper, paper window curtains, etc. Even in its crude state it is found to yield one of the best lubricants known. Mixed with common grades of soap, it makes them as pleasant to the touch as the choicest brands, rendering the skin smooth and soft, though entirely without any cleansing qualities. It is also largely used in the manufacture of patent wall plaster, in which its addition gives a smooth, glossy finish to walls and ceilings that no other substance lends. Talc powder, duly refined, is exquisitely soft and fine grained. Hence it makes an excellent infant powder, softening the tenderest skin and preventing chafing, irritation, or even "prickly heat," as will no other substance. So, too, it makes an unsurpassed molding sand for casting metals in, both its fireproof and fire-grained qualities being very valuable in fine work. Mixed with rubber, it renders it more elastic and less liable to crack. From it is also made the "French chalk" used by tailors, and shoe dealers use it in powdered form to enable one to pull on a tight-fitting shoe. The richest talc mines are now being worked in Cherokee co., N. C., where it is found in leaves and scales, very much like slate. Also a commercial name for MICA (*q. v.*).

Oil of talc: A cosmetic common in the 17th century, consisting of talc calcined. See SOAPSTONE.

Talca, a town of Chile, capital of the province of Talca, on the Claro, connected by rail with Santiago; has manufactures of ponchos; pop. (1895) 33,232.

Talc Apatite, an apatite found in chlorite schist in the Urals, containing a large percentage of magnesia replacing lime; a magnesium apatite.

Talc Chlorite, a mineral regarded by Marignac as intermediate between talc and chlorite, but stated by Des Cloizeaux to possess the optical characters of clinochlore. Dana suggests that it may be the latter mineral mixed with talc, which would account for the high percentage of silica.

Tálchyr Beds, a group of strata occurring at the base of the Gondwâna series of India. They probably occupy the same geological horizon as the Permian system of Europe, but owing to the rarity or absence of marine fossils their exact correlation with their European equivalents is somewhat uncertain. The beds are remarkable for the occurrence in them of numerous small and large erratics, some of the latter measuring 15 feet in diameter. In the neighborhood of the Godavari the included blocks of foreign and transported rocks are smoothed, polished, and striated in the same manner as glaciated stones. Moreover, the hard Vindhyan limestone which underlies this Tálchyr bowlder bed is similarly smoothed and scored in long parallel lines.

Talcoid, a snow-white variety of talc occurring in broad folia at Pressnitz, Bohemia. It contained over 67 per cent. of silica. Probably only ordinary talc with disseminated free quartz.

Talcosite, a mineral occurring in thin veins of scaly structure, resembling talc; hardness, 1-2; sp. gr., 2.46-2.5; luster, pearly; color, silver-white, greenish, yellowish. Composition: A hydrated silicate of alumina, probably related to selwynite. Occurs at Mount Ada, Heathcote, Victoria.

Talc Triplite, a variety of triplite, in which part of the protoxide of manganese is replaced by lime. Its position as a distinct variety is not, however, determined. Occurs in small yellowish grains in the lazulite rock of Horrsjöberg, Sweden.

Talegalla, or **Brush Turkey** (*Talegallus*), a genus of gallinaceous birds, in the same family (*Megapodidæ*) as the mound-building *Megapodes*. Of the four species the Australian *T. lathami* is best known. It is a large bird, almost the size of a female turkey, with blackish-brown plumage, pink-red head and neck, and yellow wattle. It inhabits the thickly-wooded parts of New South Wales, and when pursued endeavors to escape by running through the thickest brush, or by leaping to the lowest branches of a tree, from which it ascends higher and higher, branch by branch. It thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting sleepily under shelter of the branches of trees. The talegalla is generally seen in small flocks, and they make their nests together, the males heaping up, by means of their feet, mounds of several cartloads of earth and decayed leaves, which are used from year to year, new materials being added annually. The eggs are hatched by the heat of the sun and of the fermenting mound, each egg being separately buried. The parent birds partially uncover them during the day. It is said that nearly a bushel of eggs may sometimes be found in one heap. The flesh of the bird is excellent, and the eggs are also very delicate and eagerly sought after. It is thought that

this bird might be added to the list of domestic poultry.

Taled, or **Talith,** a garment of fine linen with a fringe attached to it, worn by the Jews in Talmudic times. It was ample in size, so as to admit of the head being enveloped in it while its wearer engaged in prayer.

Talent, figuratively: (1) A gift, endowment, or faculty; some peculiar faculty, ability, power, or accomplishment, natural or acquired (a metaphor borrowed from the parable in Matt. xxv: 14-30). (2) Mental endowments or capacities of a superior kind; general mental power (used in either the singular or the plural). (3) Hence, used for talented persons collectively; men of ability or talent. (4) Habitual backers of horses, or takers of odds, as opposed to the bookmakers, or layers of odds.

In Greek antiquity, the name of a weight and also of a denomination of money among the ancient Greeks, and also applied by Greek writers and their translators to various standard weights and denominations of money among different nations; the weight and value differing in the various nations and at various times. As a weight, those in general use were the Euboïc or Attic talent = 56 pounds 11 ounces troy, and the Æginetan = about 82¼ pounds. The Attic talent contained 60 Attic minæ. As a denomination of money, it was a talent's weight of silver, or a sum of money equivalent to this; so that in our current coin the Attic talent would be worth $1,185.84. The great talent of the Romans was equal to $483.25, and the little talent to $364.87½. The Hebrew talent (II Sam. xii: 30) was equal to 93 pounds 12 ounces avoirdupois; and as a denomination of money it has been variously estimated at from $1,520.31 to $1,926.54. The marginal note in the authorized version to Matt. xviii: 24, says that "a talent is 750 ounces of silver, which, at 5s. ($1.20) the ounce, is £187, 10s. ($900)."

Ministry of all the Talents, a ministry of which Lord Grenville was the head, and Fox his colleague and supporter. It was formed on Jan. 26, 1806, three days after the death of Pitt, and, after undergoing some changes, was dissolved on March 25, 1807. Its nickname was given from the boast of Mr. Canning and others that it contained all the talent of the country — *i. e.*, of both political parties in the State.

Talfourd (tal'furd), **Sir Thomas Noon,** an English dramatist; born in Doxey, near Stafford, England, Jan. 26, 1795; was brought up at Reading, where his father was a brewer. He was called to the bar in 1821, and in 1833 was made serjeant-at-law. In 1835 he was returned to Parliament for Reading, and in 1836 his tragedy of "Ion" (published the previous year) was produced at Covent Garden, and achieved distinguished success. The tragedies subsequently produced by him were "The Athenian Captive"; "Glencoe, or the Fate of the Macdonalds"; and "The Castilian," a historical tragedy. Besides his dramas he was the author of a "Life of Charles Lamb" and of "Vacation Rambles." In 1849 he was raised to the bench in the Court of Common Pleas, and received at the same time the honor of knighthood. He died suddenly, March 13, 1854, at Stafford, while delivering his charge to a grand jury.

Taliera, in botany, the *Corypha taliera* (Roxburgh), called by Sprengel *T. bengalensis,* a palm tree, akin to the talipot, but only about 30 feet high. The trunk is nearly cylindrical, and has at the top a number of fan-shaped leaves, in about 80 divisions, each about six feet long by four inches broad, the whole radiating from the points of petioles, 5 to 10 feet long, and having spines at their edges. The spadix, which is decompound, is about 20 feet high, and appears in February. The fruit which is about the size of a crab apple, is wrinkled and of a dark color. It grows in India where the leaves are used for roofing houses. The natives also write on them with their iron or steel styles.

Talinum, a genus of *Portulacaceæ.* Sepals deciduous, stamens 10 or 20, capsule three-valved, seeds many, wingless. *T. patens,* a native of Brazil, is used like the common purslane.

Talipot, Talipat, or **Taliput,** the *Corypha umbraculifera,* a palm tree, native of Ceylon and the Malabar coast, and cultivated in Bengal and Burma. It has a tall, cylindrical stem, with a soft rind and soft pink internal pith, both formed of vascular bundles. The leaves are in a cluster at the top of the stem, and are fan-shaped. A tree at Peradeniya, in Ceylon, was described in the "Indian Agriculturist" for November, 1873, as having a stem 84 feet high, terminated by a flower panicle of 20 feet, making 104 feet in all, the girth of the stem three feet from the ground round the persistent bases of the leaves was 13 feet 4 inches; at 21 feet from the ground eight feet three inches; the leaves were about 10 feet in diameter, and the age of the tree about 40 years. The pith is made into a kind of sago, the leaves are written upon by the natives with a steel stylus; they are, moreover, made into fans, mats, and umbrellas.

Talisman, a species of charm, consisting of a figure engraved on metal or stone when two planets are in conjunction, or when a star is at its culminating point, and supposed to exert some protective influence over the wearer of it. The terms talisman and amulet are often considered nearly synonymous, but the proper distinctive peculiarity of the former is its astrological character. Talis-

manic virtues have often been attributed to a peculiarly marked or formed egg, and instances are recorded by various authors of eggs hatched with figures of comets or eclipses on them. A species of talisman which has acquired considerable celebrity is the abraxas. Another historic talisman is the lee penny, a heart-shaped, dark red jewel, now set in a shilling of Edward I., with a silver chain and ring attached, supposed to have been obtained in Spain by Sir Simon Lockhart, who set out with Sir James Douglas to bear Bruce's heart to the Holy Land. As late as 1824 water in which it had been dipped was used to cure cattle bitten by a mad dog. A species of talisman at present in use in Asia is a piece of paper on which the names of the Seven Sleepers and their dog Kitmer are inscribed. Pasted on the walls of houses, it is believed to be a protection against ghosts and demons. Phylacteries were used as talismans; and in Christian Byzantium phylacteries were made bearing the figure of Solomon, the compeller of demons. See ASTROLOGY: DIVINATION: INCANTATION: MAGIC.

Talisman, Gate of the. See GATE OF THE TALISMAN.

Talita, or **Talitha,** a double star of the 3d magnitude, Ursæ Majoris, in the Bear's right fore-paw.

Talitrus, in zoölogy, a genus of Amphipoda. They have no feet in the form of claws. The third articulation of the inferior antennæ is longer than the two preceding ones united; the antennæ are large and spiny. *T. locusta* is the sandhopper. It is a little more than half an inch long. It exists in myriads along sandy shores between high and low water mark, feeding on decaying garbage. It can leap several feet into the air, and escapes pursuit by burrowing into the damp sand or taking refuge under moist seaweed.

Talladega College, a coeducational institution for colored students in Talladega, Ala.; founded in 1867 under the auspices of the Congregational Church; has productive funds exceeding $150,000; grounds and buildings valued at over $225,000; volumes in the library, about 10,000; ordinary income, $15,000; average number of faculty, 35; average students, 650; graduates, over 360.

Tallage, a sort of tax formerly levied by the English kings on towns and counties, as part of the revenues of the crown, being originally exacted probably in lieu of military service. It was abolished by statute of 1340.

Tallahassee, a city, capital of the State of Florida, and county-seat of Leon co.; on the Carrabelle, Tallahassee, and Georgia, and the Florida Central and Peninsula railroads; 194 miles E. of Mobile, Ala. Here are the State Normal, Agricultural, and Industrial Institute for Colored Pupils, State Seminary, several libraries, artesian water plants, a street railroad, National and State banks, and a number of weekly newspapers. Tallahassee is in a fruit-growing and farming section. It has cotton, cigar and ice factories, and railroad construction and repair shops, and an assessed property valuation of nearly $1,000,000. Pop. (1890) 2,934; (1900) 2,981; (1910) 5,018.

Tallahatchie, a river in Northern Mississippi which unites at Greenwood with the Yallobusha to form the Yazoo river. It is about 240 miles long and is navigable for 100 miles.

Tallapoosa, a river running through Georgia and Alabama. It unites with the Coosa about 10 miles N. E. of Montgomery, in the latter State, and forms the Alabama river. It is nearly 250 miles long and is navigable for about 40 miles.

Tallart, Camille, Comte de, a French diplomatist; born of an ancient Dauphiné family, Feb. 14, 1652; and entering the army, rose rapidly, thanks to his natural talents and to his cousin, Marshal Villeroi. As early as 1674 he commanded a corps at Mülhausen, and having served under Turenne in Elsass, been wounded at Rheinfelden and raised to the rank of Major-General (1688), he led an army over the frozen Rhine (1692) and mastered the Rheingau at a blow. As skillful a diplomatist as soldier, he helped to negotiate the Peace of Ryswyk (1697), and was employed by Louis to bring England over to the Partition Treaty. It failed to avert the War of the Spanish Succession, in which, under Bouffler, Tallart signalized himself at Kaiserswerth (1701) and Nymwegen (1702), capturing Trier, forcing Alt-Breisack to capitulate, and stripping the Prince of Hessen-Kassel of the Palatinate. Created marshal (1703), and with Marsin dispatched to command the French troops in Bavaria, Tallart lost against Marlborough and Prince Eugene the battle of Blenheim (1704), where with 15,000 of his men he fell into the hands of the English. During seven years' captivity in London he managed to secure the favor of Queen Anne, and largely contributed to the recall of his conqueror Marlborough; so when in 1711 he was released without either ransom or exchange, Louis XIV. welcomed him with the title of Duc d'Hostun. He became minister of state (1726), and died May 30, 1728.

Tallemant des Réaux, Gédéon (tä-luh-mo*ng'* dā rā-ō'), a French chronicler; born in La Rochelle, France, about 1619. At 19 he visited Italy in company with the future Cardinal de Retz, and at an early age married his cousin Elizabeth Rambouillet, daughter of a farmer of revenues, whose ample fortune enabled him to give himself to

letters and to society. About 1650 he bought for 115,000 livres the seignorial estate of Plessis-Rideau in Touraine, and was permitted to change its name to that of Des Réaux. His famous work, the "Historiettes," was written from 1657 to 1659, and is invaluable as a complete picture of the society of his time. The most finished group of these portraits in miniature is that of the famous circle of the Hôtel de Rambouillet. He was still living in 1691, but was certainly dead by 1701. His brother, the ABBÉ TALLEMANT (1620–1693), was a man of wit and an academician, but his "Plutarch's Lives" (1663) brought him little credit. His cousin PAUL TALLEMANT (1642–1712), early began to scribble verses, at 18 wrote his "Trip to the Isle of Love," an ingenious commentary on Mlle. de Scudéry's famous "Carte de Tendre" (Map of Tenderness), and entered the Academy in 1666.

Talleyrand-Périgord, Charles Maurice de (tä-lā-ro*ng*-pā-rē-gor′), **Prince of Benevento,** a French diplomatist; born in Paris, France, Feb. 13, 1754. Though the eldest of three brothers he was, in consequence of lameness caused by an accident, deprived of his rights of primogeniture, and devoted, against his will, to the priesthood. His high birth and great ability procured him rapid advancement, and in 1788 he was consecrated Bishop of Autun. On the meeting of the States-General he was elected deputy for Autun. He sided with the popular leaders in the revolutionary movements; and his advocacy of the abolition of tithes and the transference of Church lands to the State gained him great popularity. In 1790 he was elected president of the National Assembly. When the civil constitution of the clergy was adopted he gave his adhesion to it, and ordained the first clergy on the new footing. For this he was excommunicated by a papal brief, and thereupon embraced the opportunity to renounce his episcopal functions (1791). In 1792 he was sent to London charged with diplomatic functions, and during his stay there was proscribed for alleged royalist intrigues. Forced to leave England by the provisions of the Alien Act, in 1794 he sailed for the United States, but returned to France in 1796. The following year he was appointed minister of foreign affairs; but being suspected of keeping up an understanding with the agents of Louis XVIII. he was obliged to resign in July, 1799.

He now devoted himself entirely to Bonaparte, whom he had early recognized as the master spirit of the time, and after Bonaparte's return from Egypt contributed greatly to the events of the 18th Brumaire (Nov. 10, 1799), when the directory fell and the consulate began. He was then reappointed minister of foreign affairs, and for the next few years was the executant of all Bonaparte's diplomatic schemes. After the establishment of the empire in 1804 he was appointed to the office of grand-chamberlain, and in 1806 was created Prince of Benevento. After the peace of Tilsit in 1807 a coolness took place between him and Napoleon, and became more and more marked. In 1808 he secretly joined a royalist committee. In 1814 he procured Napoleon's abdication, and afterward exerted himself very effectually in reëstablishing Louis XVIII. on the throne of his ancestors. He took part in the Congress of Vienna, and in 1815, when the allies again entered Paris, he became president of the council with the portfolio of foreign affairs; but as he objected to sign the second peace of Paris he gave in his resignation. After this he retired into private life, in which he remained for 15 years. When the revolution of July, 1830, broke out, he advised Louis Philippe to place himself at its head

DUC DE TALLEYRAND-PÉRIGORD.

and to accept the throne. Declining the office of minister of foreign affairs he proceeded to London as ambassador, and crowned his career by the formation of the Quadruple Alliance. He resigned in November, 1834, and quitted public life forever. He died in Paris May 17, 1838. His "Memoirs" were published in 1891.

Tallien, Jean Lambert, a French revolutionist; born in Paris in 1769. His talent for writing and speaking soon brought him to the front at the Revolution. After being for some time connected with the "Moniteur," he became editor of the "Amides Citoyens," a journal after the fashion of Marat's "Ami du Peuple." A prominent Jacobin, he became after Aug. 10 secretary of the Insurrectionary Commune, was one of the leading "Septembrists," and afterward eloquently defended the massacres he

had promoted. His serivces on this occasion gained him a seat in the Convention, where he of course joined the Mountain, and was an earnest defender of Marat, and a savage advocate for the execution of the king. Sent by the Convention to Bordeaux and the W. departments in 1794, he at first distinguished himself by a cruelty and profligacy worthy of the most infamous of the Terrorists. In the prison of Bordeaux, however, he met the beautiful Madame de Fontenai, *née* Senhora Tereza de Cabarrus, for whom he conceived a violent passion. He liberated her from prison, and drew down on himself the suspicion of the central authorities by relaxing the cruelty of his persecutions.

Recalled to Paris, he managed by an assumption of revolutionary fervor to avoid an immediate downfall, but the hatred and suspicion of Robespierre were not allayed. Madame de Fontenai was imprisoned. "Shut in the horrid pinfold of death,' says Carlyle, "the senhora smuggles out to her red-gloomy Tallien the most pressing entreaties and conjurings: Save me; save thyself!" This could only be accomplished by the ruin of Robespierre. Tallien placed himself at the head of the party afterward known as the Thermidorians, vigorously attacked the triumvirate of terror, and ultimately brought about its downfall. From this point his political influence declined. Madame de Fontenai, on the other hand, whom he now married, became the most prominent personage in Parisian society, her salon, thronged by the party known as the *jeunesse dorée,* being the most brilliant of the brilliant period of the Directory. Tallien continued in the legislature till 1798, when he accompanied Bonaparte to Egypt in the character of a *savant.* The ship in which he was returning was captured by an English cruiser, and he was *fêted* by the Whig party in London in 1801. In 1802 he was divorced from his wife, who afterward married the Prince de Chimay, and died Nov. 16, 1831. Tallien, after holding for some years the post of French consul at Alicante, died in Paris Nov. 16, 1820, in poverty and obscurity.

Tallingite (after the well-known mineral collector Richard Talling, of Cornwall), a mineral occurring in thin crusts, on killas, at the Botallack mine, Cornwall; hardness, 3.0; sp. gr., 3.5; color, bright blue; fragile. Composition: Chloride of copper, 22.55; oxide of copper, 53.29; water, 24.16 = 100, which corresponds to the formula 4CuOHO + CuClHO + 3aq. A variety of Atacamite.

Tallis, Thomas, an English organist; called "the father of English cathedral music"; born between 1510 and 1520 His first known appointment was that of organist of Waltham Abbey, which he held till the abbey was dissolved in 1540, when it is conjectured he became a "gentleman of the Chapel Royal." In Day's "Psalter," published in 1560, there appear eight tunes composed by Tallis, one of these being still used to Ken's evening hymn. In 1575–1576 letters patent were granted to Tallis and William Byrd, according to them the exclusive privilege of printing music and ruled music paper for 21 years. The first work printed under this patent was issued in 1575, entitled, "Cantiones quæ ab argumento Sacræ vocantur, quinque et sex partium," containing 16 motets by Tallis and 18 by Byrd. Tallis died Nov. 23, 1585, and was buried in the chancel of Greenwich parish church, with an epitaph in verse, which was afterward set to music by Dr. Cooke as a glee. Tallis, besides writing a large number of anthems, pieces, responses, and "Te Deums" was the author of a celebrated work — "Song of the Forty Parts," composed for eight choirs of five voices each. Tallis, it has been said, was "one of the greatest contrapuntists of the English school. His works are invested with great learning and much dignity, and are highly calculated to impress by their solemnity and power."

Tallmadge, Benjamin, an American military officer; born in Brookhaven, N. Y., Feb. 25, 1754. He attained the rank of colonel; in September, 1779, captured a band of Tories on Long Island; and in 1780 took Fort George, on the same island. He was a member of Congress in 1801–1817. He died in Litchfield, Conn., March 7, 1835.

Tallow, in chemistry, a name applied to the harder and less fusible fats occurring chiefly in the animal kingdom, the most common being beef and mutton tallow. When pure it is white and almost tasteless, and consists of stearin, palmitin, and olein in varying proportions.

In manufacturing and commerce, the fat and suet obtained from butchers are chopped into pieces by a man called the "renderer," and it is then boiled in water, the greater part of the fat being melted from the membranes and floating to the surface, whence it is removed by skimming; the rest is forced out by a powerful press, the residuum consisting of membranous matter called greaves or cracklings, being subsequently macerated in warm water, and given as food to poultry, dogs, etc. Tallow is of two kinds, viz., white and yellow candle tallow, and common soap tallow. The white candle tallow, when good, is brittle, dry, and clean. Yellow candle tallow, when good, should be clean, dry, hard when broken, and of a fine yellow color throughout. Soap tallow is used for making soap, and for greasing machinery. A great deal of tallow is also used for the dressing of leather.

Tallow Tree, the *Stillingia sebifera,* a native of China. The leaves are rhomboidal, tapering at the tip, with two glands at the top of the petiole. The fruits are about half an inch in diameter, and have three seeds, which are covered by a kind of wax, used in China for making candles, whence the name tallow tree. They are boiled in large cauldrons, then sufficiently bruised to enable the fat to be removed without breaking the seeds, and pressed. The candles made from this wax are coated with bees' wax to prevent them from melting in hot weather. The wood is hard, and used for printing blocks, and the leaves for dyeing black. Also *Vateria indica,* a native of the Malabar coast. See VATERIA.

Tally, a notched stick employed as a means of keeping accounts. In buying or selling it was customary for the parties to the transaction to have two sticks, or one stick cleft longitudinally into two parts, on each of which was marked with notches or cuts the number or quality of goods delivered, or the amount due between debtor and creditor, the seller keeping one stick and the buyer the other. The mode of keeping accounts by tallies was introduced into England by the Normans, 1066. Besides accounts, other records were formerly kept on notched sticks, as almanacs, in which red-letter days were signified by a large notch, ordinary days by small notches, etc. Such were formerly very common in most European countries. In England tallies were long issued in lieu of certificates of indebtedness to creditors of the State. In 1696, according to Adam Smith, this species of security was at 40–60 per cent. discount, and bank notes 20 per cent. Seasoned sticks of willow or hazel were provided, and these were notched on the edge to represent the amount. Small notches represented pence; larger, shillings; still larger, pounds; proportionately larger and wider, were 10, 100, 1,000 pounds. The stick being now split longitudinally, one piece was given to the creditor, and the other was laid away as a record. When an account was presented for payment, the voucher was compared with the record. When paid, the tally and counter-tally were tied up together, and laid away, accumulating for a long series of years. The system of issuing exchequer tallies was abolished by an act of George III., and by acts of William IV., the accumulated tallies were ordered to be destroyed. They were accordingly burned in a stove in the House of Lords, but the stove being over-heated, unfortunately set fire to the paneling of the room, and the Houses of Parliament were destroyed. Anything made to correspond with or suit another. A label or ticket of wood or metal used in gardens for the purpose of bearing either the name of the plant to which it is attached, or a number referring to a catalogue. Also, a certain number of cabbages.

Talma, Joseph François (täl-mä′), a French actor; born in Paris, France, Jan. 15, 1763. He was educated at Mazarin College, and afterward went to London with his father, a dentist; studied in the hospitals there, and on returning to Paris was apprenticed to a dentist. He had been on the stage, however, both in London and Paris, and made his professional début Nov. 21, 1787, at the Comédie Française. He founded, with a few others, the theater afterward known as the Theâtre de la République. He won his fame as a tragedian, but made many improvements in the naturalness of stage productions. He wrote "Memoirs of Lekain, and Reflections on that Actor and the Theatric Art" (1825), which was republished in 1856 under a slightly different title. His own "Memoirs" were edited by Alexandre Dumas (1856). He died in Paris Oct. 19, 1826.

Talmage, Thomas De Witt, an American clergyman; born in Bound Brook, N. J., Jan. 7, 1832; was graduated at the New Brunswick Theological Seminary in 1856; and ordained pastor of the Reformed Dutch Church in Belleville, N. J., in the same year. He was pastor of the Central Presbyterian Church in Brooklyn, N. Y., in 1869–1894, during which time this well-known place of worship was three times destroyed by fire. Feeling himself unable to build another church edifice, he resigned his charge and spent some time in Europe; becoming on his return associate and later full pastor of the First Presbyterian Church in Washington, D. C. He held this charge till 1899, when he resigned in order to apply himself wholly to literary work. His sermons were published every week for 30 years, and in 1901 it was estimated that their publication in 3,600 different papers had carried them to no fewer than 30,000,000 people weekly. He was for many years the editor of the "Christian Herald," and was the author of "Crumbs Swept Up," "Woman: Her Powers and Privileges"; "From Manger to Throne"; "Every-Day Religion"; etc. He died in Washington, D. C., April 12, 1902.

Talmage, James Edward, an American geologist; born in Hungerford, England, Sept. 21, 1862. His family immigrated to Utah in 1876, having become Mormons. He was educated at Lehigh and Johns Hopkins Universities; and was graduated as an analytic chemist at the former in 1891. He was president of the Latter-day Saints College, Salt Lake City, in 1888–1893, and president of the University of Utah in 1894–1897, when he resigned the presidency of the latter, but retained the chair of geology there. His publications include "First Book of Nature" (1888); "Domes-

tic Science" (1891); "The Articles of Faith"; "The Book of Mormons, an Account of Its Origin, etc."; "The Great Salt Lake, Present and Past"; etc.

Talmud, the name of the fundamental code of the Jewish civil and canonical law, comprising the "Mishna" and the "Gemara," the former as the text, the latter as the commentary and complement. The oldest codification of Halachoth, or single ordinances, is due to the school of Hillel. Simon, son of Gamaliel II, and great-grandson of Gamaliel I., mentioned in the New Testament, and his school carefully sifted the material thus brought together. He died A. D. 166. His son Jehudah Hannasi, commonly called Rabbi, who died 219, and his disciples brought the work to its close in six portions (Sedarim), 63 treatises (Mesichtoth), and 524 chapters (Perakim), which contain the single "Mishnas." But besides this authoritatively compiled code there were a number of other law collections, partly anterior to it, and not fully embodied in it, partly arising out of it — as supplements, complements, bylaws, and the like — partly portions of the ancient Midrash, partly either private text-books composed by the masters of the academies for their lectures or enlargements of the existing "Mishna." All this additional material was collected, not rarely together with the dissensions which begot it, under the name of "Baraitoth," "foreign," "external," by Chaiya and his school, in the succeeding generation.

Not to be confounded with them, however, are the collections of "Toseftas," "supplements," or "Great Mishnas," which, commenced at the time of Jehudah Hannasi himself, and continued after his death by his scholar Chaiya and Hoshaiya, embody much of what has been purposely left out in the concise "Mishna," which only embraced the final dicta and decisions. Such "additions" we possess now to 52 treatises, forming together 383 Perakim or chapters. All these different sources of the "Oral Law" — finally redacted before the end of the 3d century, though probably not committed to writing till A. D. 550 — belong to the period of from about 30 B. C. to about A. D. 250. This great mass of legal matter, though apparently calculated to provide for every case, if not for all times, was yet found insufficient. The dicta of later masters, the decisions of the courts, the discussions on the meaning and purport of special traditions, the attempts at reconciling apparent contradictions in the received material, the amplifications or modifications of certain injunctions rendered necessary by the shifting wants and conditions of the commonwealth — all these and a number of other circumstances made a further codification peremptory.

Talmud

It should be stated here that this "Mishna" (Mathnisin), though it contained nothing but what were indigenous laws and institutions, was yet not a little influenced — if the very fact of its redaction was not indeed caused — by the spirit of the times. At Berytus, at Alexandria, at Rome the legal schools were then in their most vigorous stage of development and everywhere system and method were being introduced into what till then had been a vast complex of traditional and popular institutions, decrees, and decisions. The "Mishna" in all respects fulfilled the conditions reasonably to be demanded from such a text-book as it was intended to form; it was clear, concise, complete, and systematic, and moreover composed in as classical a Hebrew as still could be written in those days of decadence of the "sacred language."

The further development of this supplementary, oral, or second law — in fact rather an exegesis thereof — together with the discussions raised by apparent contradictions found in the individual enactments of the Mishnic doctors, is called "Gemara" — *i. e.* discussion, complement, or, according to another explanation, doctrine. This "Gemara" contains, apart from the Halacha, which is generally written in Aramaic, also a vast number of non-legal, chiefly Hebrew, fragments — homiletic matter, tales, legends, and the like — called Haggada.

There are two "Talmuds" the one called the "Talmud of the Occidentals," or the "Jerusalem (Palestine) Talmud," which was closed at Tiberias, and the other the "Babylonian Talmud." The first of these now extends over 39 treatises of the "Mishna" only, though it once existed to the whole of the first five *Sedarim* or portions. It originated in Tiberias in the school of Johanan, who died A. D. 179. Its final redaction probably belongs to the end of the 4th century; but the individual academies and masters through whom it received its completion cannot now be fixed with any degree of certainty. There is less discussion and more precision of expression in this than in the second or "Babylonian Talmud," emphatically styled "our Talmud," which was not completed until the end of the 5th century, and which makes use of the former. As the real editor of the "Babylonian Talmud" is to be considered Rabbi Ashe, president of the academy of Sora in Babylonia (A. D. 375–427).

Both the "Mishna" and the Palestine "Gemara" had, notwithstanding the brief period that had elapsed since their redaction, suffered greatly, partly by corruptions that had crept into their (unwritten) text through faulty traditions, partly through the new decisions arrived at independently in the different younger schools — of which there flourished many in differ-

Talmud

ent parts of the Dispersion — and which were at times contradictory to those arrived at under different circumstances in former academies. To put an end to these disputes and the general confusion arising out of them, which threatened to end in sheer chaos, Rabbi Ashe, aided by his disciple and friend Abina or Rabina I. (abbreviated from Rab Abina), commenced the cyclopean task of collecting anew the enormous mass of Halachistic material which by that time had grown up.

The method he pursued was simple enough. His disciples met twice a year at Sora, in spring and in autumn. At the spring gathering he gave out all the paragraphs of one treatise; and the disciples had the task to find out till the autumn meeting what opinions the different schools had pronounced on the special points thereof. He then investigated the whole critically, and put it into shape according to a certain order. This process took him, with the assistance of 10 secretaries, no less than 30 years; and many years were spent by him in the revision of the work, with which he proceeded in the same manner as he had done with the compilation itself. The final close of the work, however, is greatly due to Rab Abina II., head of the Sora academy (473–499). He was the last of the Amoraim expounders, who used merely oral tradition. After them came the Saboraim, the reflecting, examining, critical, the real completers of the Babylonian Talmud, and by many in ancient and modern times declared to have first reduced "Mishna" and "Talmud" to writing.

The "Babylonian Talmud," as now extant, comprises the "Gemara" to almost the whole of the 2d, 3d, and 4th Sedarim (portions), further to the first treatise of the first, and to the first of the last order. The rest, if it ever existed, seems now lost. The whole work is about four times as large as the Jerusalem one, and its 36 treatises, with the commentaries generally added to them in our editions (Rashi and Tosafoth), fill 2,947 folio leaves. The language of the Talmud is, as we said, Aramaic (Western and Eastern), closely approaching to Syriac. The minor idiomatic differences between the two are easily accounted for by the different time and place; but the additional matter — quotations and fragments from older Midrash and Gemara collections, Haggada, etc. — is, as before stated, principally written in Hebrew.

The masters of the "Mishna" (Tannaim) and of the "Gemara" (Amoriam) were followed by the Saboraim. The code of the oral law had come to a close with the second named; and not its development, but rather its proper study, elucidation, and carrying into practice was the task of the generations of the learned that followed. Apart from this, the Aramaic language itself began to die out as the popular language, and required a further study. The Saboraim no longer dared to contradict, but only opined on the meaning and practicability of certain enactments, and undertook the task of inculcating and popularizing the teachings laid down by their sires; apart from bestowing proper care upon the purity of the text, and adding some indispensable glosses. Then activity was at its height in the 8th century, when Karaism, which utterly denied the authority of the Talmud, sprang into existence. Respecting, however, this authority of the Talmud itself there has never been anything approaching to a canonicity of the code, or to a reception of it as a binding law book by the whole nation. The great consideration in which it was always held is owing partly to its intrinsic value, and to the fact of its becoming the basis of all further development of Jewish literature (it being undeniably the most trustworthy receptacle of the traditional Jewish law), and partly to a persecution against the Jews in the Persian empire at the time of Yezdigerd II., Firuz, and Kobad (439–531), who closed the schools and academies for a space of nearly 80 years, during which this book was the sole authoritative guide of public conscience, and remained endowed with its importance even when the schools were restored.

The best commentaries of the "Mishna" are by Maimonides and Bartenora; of the "Babylonian Talmud" by Rashi and the Tosafists of France and Germany. An abstract of the Talmud for practical legal purposes by Maimonides is called "Mishne Thorah." The "Mishna" was first printed at Naples, 1492; the "Talmud of Jerusalem" at Venice, by D. Bomberg, 1523. The "Babylonian Talmud" was first published at Venice by him in 1520. It is generally printed in 12 folios, the text on the single pages being kept uniform with the previous editions to facilitate the references. No translation of the "Gemara" has ever been carried further than a few single treatises. The complete "Mishna" on the other hand has been translated repeatedly into Latin, German, Spanish, etc., by Surenhus, Rabe, Jost, and others. We must refrain here from attempting a general characterization of the Talmud, a work completely *sui generis*, which is assuredly one of the most important records of humanity. Nothing can give even an approximate idea of the immensity of material, historical, geographical, philological, poetical, that lies hidden in its mounds. A contribution to the records of fanaticism may also be found in the "exoteric" history of the Talmud, which was albeit utterly unknown save by a few garbled extracts, prohibited, confiscated, burned, and generally prosecuted and inveighed against by emperors, popes, theo-

logians, and fanatics generally, from Justinian down almost to our own day, as perhaps no other book has ever been. In our own times, however, its value begins to be recognized by great scholars, not merely as the only source of the knowledge of Judaism, but as the chief source — next to the Gospels — even for the history of the origin and early days of Christianity; a notion long ago hinted at by eminent divines like Lightfoot and others.

Talpa, the mole; the typical genus of *Talpidæ*, with eight species. Body stout and thick, furry; head long and pointed, muzzle cartilaginous, protected by snout bones; eyes very small, no external ears; fore-feet short and wide, with five united toes, armed with trenchant nails for digging; hind-feet with five toes, but weak; tail short. Except in *T. europæa*, the common mole, which ranges from England to Japan, the eyes are covered by a membrane; *T. cæca* is found S. of the Alps; *T. wogura*, *T. longirostris*, *T. moschata*, and *T. leptura* occur N., and *T. leucrura* and *T. micrura* S. of the Himalayas.

Talpidæ, a family of *Insectivora*, limited to the temperate regions of Europe, Asia, and North America. The species are fossorial, rarely natatorial, distinguished from the *Soricidæ* by the presence of zygomatic arches and the form of the teeth. Eyes very small, in some species covered with skin; ears short and hidden by the fur; the fore-limbs modified for digging. There are two sub-families *Myogalinæ* and *Talpinæ*. There are several extinct genera commencing with *Talpayus*, and ending with *Palæospalax*.

Talpinæ, the typical sub-family of *Talpidæ*. Clavicles and humeri very short and broad; large falciform bone in the manus. There are five genera, divided into two groups.

A. Having front upper incisors much larger than second pair (New World moles), *Scalops*, *Scapanus*, and *Condylura*.

B. Front incisors scarcely larger than second pair (Old World moles), *Scaptonyx* and *Talpa*.

Taltalite (after Taltal, Atacama, South America, where found), a mineral supposed by David Forbes, who named it, to be a distinct species, but shown by Pisani to be a tourmaline mixture with oxide of copper and other impurities.

Tálúk, properly **Taalluqah,** an Arabic word implying dependence, used through India for a species of land tenure. In Bengal the tálúk is an estate subordinate to the *zemindary* or estate in chief; one class pays in revenue direct to the government, the other only through the *zemindar*. In the Northwestern Provinces the term is applied to an estate divided between several proprietors, superior and inferior, of whom the latter pay revenue through the former. In Oude the term is used of the great landholders, some of whom have the title of Rajah or Maharajah, and immense incomes. In Madras a tálúk is merely a large revenue division.

Talus, in anatomy, the ankle bone. It articulates with the tibia above, the *os calcis* below, and the scaphoid in front. It receives the weight of the body from the leg. Its convex anterior extremity is termed the head, and the circular groove behind it the neck. Called also the Astragalus (*q. v.*). In architecture, the slope or inclination of any work, as of a wall inclined on its face, either by decreasing in thickness toward the summit or by leaning it against a bank, as a retaining or breast wall. In fortification, the slope of a work, as a bastion, rampart, or parapet. (In this sense written also talut.) In geology, a sloping heap of rocky fragments broken off from the face of a steep rock by the action of the weather, and accumulating at its base. So called from its resemblance to a talus in fortification. In surgery, a variety of club-foot, in which the heel rests on the ground, and the toes are drawn toward the leg.

Talvj. See Robinson, Therese A. L.

Tamandua, in zoölogy, a genus of *Myrmecophagidæ*, from the forests of South and Central America. In anatomical structure the genus is closely akin to *Myrmecophaga*, but the head is less elongated, the fur short and bristly, the tail tapering and prehensile, the top of the terminal part and the under side throughout naked and scaly. The fifth toe on the fore feet is concealed within the skin. Only one species has been distinguished, *T. tetradactyla*; but as different individuals vary greatly in coloration, it is not improbable that other species exist. The *T. tetradactyla* is an ant eater, smaller than the great ant eater or ant bear, from which it differs in being arboreal. The usual color is yellowish-white, with a broad, black lateral band, which covers nearly the whole of the side of the body.

Tamaqua, a borough in Schuylkill co., Pa.; on the Little Schuylkill river, and on the Philadelphia and Reading, and the Central of New Jersey railroads; 40 miles N. of Reading. Here are a high school, waterworks, electric lights, National and State banks, and several daily and weekly newspapers. It has large coal interests, flour, powder, and planing mills, machine shops, and several foundries. Pop. (1890) 6,054; (1900) 7,267; (1910) 9,462.

Tamar, a small river in England, flowing between the counties of Cornwall and Devonshire; empties into Plymouth Sound, 2 miles above Plymouth; length about 60 miles. Also a river of Tasmania, formed

by the union of the North and South Esk, and flowing into Bass's Straits at Fort Dalrymple.

Tamarack, the American or black larch, *Larix pendula* or *americana,* called also *Abies pendula.* It has weak and drooping branches, which sometimes take root, forming a natural arch. The leaves are clustered and deciduous, the cones oblong with numerous spreading scales. It constitutes a feature of the forests in Canada and the Northern United States. Its timber is valuable, but less so than the larch. It is cultivated in Europe, being more graceful and greener than the common larch.

Tamaricaceæ, tamarisks; an order of hypogynous exogens, alliance Violales. Shrubs or herbs with rod-like branches. Leaves alternate, scale-like, entire, usually pitted; flowers in close spikes or racemes; calyx four or five-parted, persistent, imbricated in vernation; petals inserted into the base of the calyx, imbricated in æstivation; stamens equal in number to the petals, or twice as many, distinct or monadelphous; styles three, ovary superior. Fruit capsular, three-valved, one-celled, many seeds on three placentas. Found in the Northern Hemisphere of the Old World.

Tamarin, the name of certain South American monkeys. The tamarins are active, restless, and irritable little creatures, two of the smallest being the silky tamarin (*Midas rosalia*) and the little lion monkey (*M. leonina*), the latter of which, though only a few inches in length, presents a wonderful resemblance to the lion.

Tamarind, the *Tamarindus indica.* Leaves abruptly pinnate, with many pairs of small leaflets; flowers in racemes; calyx straw-colored; petals yellow, streaked with red, filaments purple, anthers brown. It is an evergreen tree, 80 feet high by 25 in circumference, cultivated in India as far N. as the Jhelum, and very largely planted in avenues and "topes." The wood, which is yellowish-white, sometimes with red streaks, is hard and close-grained. It weighs about 83 pounds per cubic foot, is highly prized, but is very difficult to work, and is used in India for turning wheels, mallets, planes, furniture, rice-pounders, oil and sugar mills, etc. It furnishes excellent charcoal for the manufacture of gunpowder. The pulp of the legumes pressed in syrup is a delicious confection. The flowers and fruit are used in India as an astringent or as a mordant in dyeing, especially with safflower; the leaves furnish a yellow dye. The seeds yield a clear, bright, fluid oil, with an odor like that of the linseed; their powder mixed with thin glue makes a strong cement for wood. The West Indian and South American variety of *T. indica* (variety *occidentalis*) has legumes only three times as long as broad, whereas the Indian tree has them six times as long.

TAMARIND: BRANCH IN FLOWER.
a, seed-pod section.

The tamarinds sold in the United States are chiefly West Indian tamarinds. They differ from the Black or East Indian tamarinds, of which the preserved pulp is black. In pharmacy tamarinds are used as gentle laxatives; they are refrigerant from the acids which they contain, and, when infused, constitute a cooling drink in fevers. They enter into the *Confectio sennæ.* In India the seeds are given in dysentery, etc.; in the Mauritius a decoction of the bark is given in asthma.

Tamarix, the typical genus of *Tamaricaceæ or Tamariscineæ.* Sepals four to five, equal, distinct; petals four to five, distinct, or united at the base; stamens 4 to 10; styles three or four; stigmas distinct, sessile, feathery; capsule one-seeded, three-valved; seeds numerous, without a beak; pappose. Known species 20; all from the Eastern Hemisphere. They are shrubs growing gregariously in bushy clumps, along river banks or basins, etc., in desert tracts, as along the banks of the Suez Canal. *T. gallica,* the French, called also *T. anglica,* an evergreen shrub or small tree, 5 to 10 feet high, with very slender and feathery branches, minute, amplexicaul, adpressed, acute leaves, and lateral, somewhat panicled spikes of white or pink flowers, is found on the S. and E. coasts of England, but is an alien. It is wild on the shores of the Atlantic and the Mediterranean, and in Western Asia and India. Its bark is slightly bitter and astringent. This species, and *T. africana,* if burnt, yields much sulphate of soda. *T. mannifera* produces the manna of Mount Sinai, which, however, is not a natural exudation from the tree, but arises from a puncture of an insect, *Coccus mannipara. T. dioica* and *T. articulata* (called also *T. orientalis*) are found on the banks of rivers and on sea coasts throughout India. The former yields a gum which appears nodular, and is transparent in the central speck of each tear, while opaque on the circumference. The latter also furnishes a small quantity of gum. The galls and bark of *T. indica, T. dioica, T. furas,* and *T. orientalis* are used

in tanning and as an auxiliary in dyeing. They are also used medicinally as astringents. Their action is due to the tannic and gallic acids which they contain.

Tamatave, a seaport on the coast of Madagascar and the chief commercial center of the island; pop. 5,000–7,000.

Tamaulipas (tä-mou-lē'päs), a State of Mexico, bordering on Texas and the Gulf of Mexico; is about 400 miles long and 130 miles broad; area, 32,128 square miles; pop. (1900) 218,948. The surface is diversified and the soil generally fertile. It produces most of the grains, fruits and woods of the temperate zone. Iron, silver, and salt are the chief mineral products. Stock of all kinds is raised and a considerable trade in them and other articles is carried on. The principal ports are Tampici and Matamoras.

Tambelan Islands, a group in the China Sea, between Borneo and Singapore. They are under Dutch control.

Tamberlik, Enrico, an Italian tenor singer; born in Rome, Italy, March 16, 1820. He began his career at Naples in 1841, and in 1850 went to England, where he was a favorite for 24 years. He visited the United States in 1857. After his retirement from the stage he lived in Madrid, where he engaged in the manufacture of small arms. He died in Paris March 15, 1889.

Tambour. See TAMBOUR WORK.

Tamboura, a musical instrument of the guitar species, with strings of wire struck with a plectrum. The neck is long, and the body, of gourd-shape, is often beautifully ornamented. The tamboura is found in Persia, Turkey, Egypt, and Hindustan, and it was known to the Assyrians and Egyptians under various names.

Tambourine, or **Tambourin,** an ancient pulsatile musical instrument of the drum class, popular among all European people, but particularly those of the S. The Biscayan and Italian peasantry employ it on every festal occasion. It is formed of a hoop of wood, sometimes of metal, over which is stretched a piece of parchment or skin; the sides of the hoop are pierced with holes, in which are inserted pieces of metal in pairs, called jingles. Small bells are sometimes fastened on to the outer edge of the hoop. It is sounded by being struck with the knuckles, or by drawing the fingers or thumb over the skin, which produces what is called "the roll," a peculiar drone mingled with the jingle of the bells or pieces of metal. Also, a stage dance formerly popular in France. It was of a lively measure, and accompanied with a pedal bass in imitation of the drone caused by rubbing the thumb over the skin of a tambourine.

Tambour Work (French, *tambour,* a drum), a species of embroidery on muslin or other thin material, worked on circular frames which resemble drum heads. The practice of tambouring is rapidly dying out, being replaced by pattern weaving, by which tambour work can be closely imitated. See EMBROIDERY.

Tambov, a province of Russia, S. of Nijni-Novgorod and Vladimir, between the basins of the Oka and the Don; area, 25,710 square miles; pop. (1897) 2,715,453. It is one of the largest, most fertile, and most densely peopled provinces of Central Russia. More than two-thirds of the surface is arable. The principal crops are corn and hemp. Vast numbers of excellent horses, cattle, and sheep are reared. The chief industrial establishments are distilleries, tallow-melting works, sugar works, and woolen mills. TAMBOV, the capital, 263 miles S. E. of Moscow, is built mostly of wood. It has a great trade in corn and cattle. Pop. (1897) 48,134.

Tamerlane. See TIMUR.

Tamias, in zoölogy, the ground squirrel; a genus of *Sciurinæ,* with four species, all found in North America, one of which (*T. asiaticus*) extends through Siberia into Eastern Europe. The species are characterized by the possession of cheek pouches, and by their coloration, the fur of the back being marked with alternate light and dark bands. They are popularly known as chipmunks, and are among the commonest of the indigenous rodents.

Tamils, the name of a race which inhabits South India and Ceylon. The Tamils belong to the Dravidian stock of the inhabitants of India, and are therefore to be regarded as among the original inhabitants who occupied the country before the Aryan invasion from the N., but they adopted the higher civilization of the Aryans. The Tamil language is spoken not only in South India and Ceylon, but also by a majority of the Indian settlers in places further E., as Pegu and Penang. There is an extensive literature, the greater part of it in verse. Among the chief works are the "Kural" of Tiruvalluvar, an ethical poem, and the Tamil adaptation of the Sanskrit "Ramayana."

Tammany, Society of, or **Columbian Order,** formed in New York City in 1789, as a counterweight to the so-called "aristocratic" Society of the Cincinnati; deriving its name from a noted friendly Delaware chief named Tammany, who had been canonized by the soldiers of the Revolution as the patron saint of America. The grand sachem and 13 sachems were intended to typify the President and the governors of the 13 original States.

The society was at first a social organization, but about 1800 the majority of

its members were in sympathy with Aaron Burr, and the society entered politics under his standard. From the first the qualities that have always been most prominent in it prevailed, thorough organization and a thorough canvass. Tammany was for a short time allied with DeWitt Clinton, but they separated and Tammany came to be recognized as the regular Democratic faction. It had thus gained a position in New York politics. Tweed was its "boss" in the days of his success, and his overthrow dealt it a severe blow, though it has always recovered its position. He was followed by John Kelly; he in turn by Richard Croker, who directed the society's course in National and State campaigns till 1902. In January, 1902, Croker brought about the appointment of Lewis Nixon as chairman of the finance committee, the office in which the control of the society resides. Tammany's organization and traditions both tend to make it subject to the control of a small clique, and its large following in a State which is always doubtful gives it an influence in national politics otherwise out of proportion to its numerical strength.

Tammerfors, the chief manufacturing city of Finland; 50 miles N. W. of Tavastehus. It is situated on a rapid which connects two lakes and affords motive power to cotton, linen, paper, and woolen mills. Pop. (1897) 26,713.

Tammuz, a Syrian deity for whom the Jewish women held an annual lamentation (Ezek. viii: 14), doubtless borrowing the practice from the Phœnicians. Tammuz has generally been identified with the Phœnician sun god Adonis, or the Egyptian god Osiris. The Adonia or feast in honor of Adonis commenced with the new moon of July, when on a certain night an image of the god was laid out on a bed by women, and bewailed in woful ditties. After a time spent in this way lights were brought in, and the mouths of the mourners anointed by the priest, who whispered, "Trust ye, communicants, the god having been saved, there shall be to us, out of pains, salvation."

Tammy, Tamis, Tamine, or **Taminy,** a kind of woolen cloth highly glazed, used for making fine sieves employed in cooking, which are also called tammies. It is also used under the names of lasting and durant for ladies' boots.

Tampa, a city and county-seat of Hillsboro co., Fla.; on Hillsboro river, Tampa Bay, and the Plant System and the Florida Central and Peninsular railroads; 30 miles E. of the Gulf of Mexico. It is in a lemon and orange growing region, and is one of the favorite health resorts of Florida. It contains many hotels, the Convent of Holy Names, Female Seminary, waterworks, street railroad and electric light plants, National banks, and several daily, weekly, and monthly periodicals. Its chief industry is the manufacture of cigars. The assessed property valuation is nearly $6,000,000. During the American-Spanish war Tampa was one of the great mobilization camps. Pop. (1890) 5,532; (1900) 15,839; (1910) 37,782.

Tampa Bay, the largest inlet of the Gulf of Mexico, on the W. coast of Florida. It affords excellent anchorage, and at its entrance are many islands.

Tampan, a species of tick described by Dr. Livingstone as occurring in Angola, and notable for its irritating bite. It usually selects the interspaces of fingers or toes, and adheres to the skin by means of a well-developed proboscis, drawing a large quantity of blood, and causing symptoms resembling those of acute inflammation.

Tampico (tăm-pē′kō), a seaport town in the State of Tamaulipas, Mexico, on Lake Tampico, near the Gulf of Mexico. It has some good dwellings in the Spanish style, military and naval monuments, and an important trade with the United States and Great Britain. The principal exports are specie, hides, tallow, bones, and jerked beef. Pop. (1900) 16,313.

Tamsui, a town on the N. coast of Formosa, one of the treaty ports, with a trade in tea; pop. 95,000.

Tamtam, or **Tomtom,** a kind of native drum, used in the East Indies and Western Africa. It is generally made of a hollow cylinder formed of fibrous wood, such as palm tree, or of earthenware, having each end covered with skin. It is beaten on with the fingers or open hand, and produces a hollow, monotonous sound. Also a Chinese gong.

Tamus, the black bryony; a genus of *Dioscoreaceæ.* Perianth campanulate, in six deep segments; stigmas three, two-lobed. Berry imperfectly three-celled; seeds few, globose. Known species one or two. *T. communis* is the common black bryony. The young suckers of this plant and of *T. cretica* are eaten in Greece, but need to be well boiled, else they are purgative and even emetic.

Tamworth, a town on the border of Stafford and Warwick shires, England; at the confluence of the Tame and Anker; 110 miles N. W. of London. Burned by the Danes in 911, and rebuilt by the Princess Ethelfleda, it was the seat of a castle of the Saxon kings, which was afterward held by the Marmion, Ferrars, and other families, and now belongs to the Marquis of Townshend. That castle, which ranges in date between Saxon and Jacobean times, crowns a knoll 130 feet high; in its noble round keep is a room where Mary Queen

of Scots was a prisoner. The Church of St. Edith, restored since 1870 at a cost of £10,000, has some interesting monuments and a curious double tower staircase. There are also a bronze statue of Peel, the new Jubilee municipal buildings and assembly rooms, a town hall (1701), a grammar school (1858; rebuilt 1868), almshouses founded by Thomas Guy, a cottage hospital, recreation grounds, etc. The manufactures include elastic tape, small wares, paper, etc.; and in the vicinity are market gardens and coal pits. A municipal borough, chartered by Elizabeth, Tamworth returned two members to Parliament till 1885. Pop. (1901) 7,271.

Tana, a river in the extreme N. of Norway; forming part of the boundary between it and Russia. Also a river of East Africa, within the British sphere of influence; rising in Mount Kenia, navigable for about 100 miles in the rainy season.

Tana, *Tupaia lana;* a small insectivorous mammal, from the forests of Sumatra and Borneo, living on or near the ground. The body is eight or nine inches long, the color varying in different individuals, but usually of some shade of reddish-brown. A variety, in which the tail is of a golden-yellow, is known as the golden-tailed tana.

Tana. See TZANA.

Tanacetic Acid, an acid said to exist in the common tansy. It is crystalline, and is soluble in water and in alcohol.

Tanacetin, a yellowish-white granular mass extracted from the leaves and flowers of the tansy. It is insoluble in water, slightly soluble in alcohol, and very soluble in ether, has a bitter, sharp taste, and is precipitated by plumbic, ferric, and mercurous salts, not by tannic acid.

Tanacetum, tansy; a genus of Composites, sub-tribe *Artemisicæ.* Strong-scented herbs, often shrubby below. Leaves alternate, generally much divided; heads solitary or corymbose, subglobose, discoid, yellow; involucre hemispherical, imbricated; receptacle naked; ligulate florets short and trifid or wanting; pappus none, the achenes angled, crowned with a large epigynous disk and having a membranous margin. Found in most continents. Known species about 50. *T. tenuifolium,* from Kumaon and Western Tibet, is used by the natives for flavoring puddings.

Tanæcium, a genus of *Crescentiaceæ;* climbing shrubs, often with rooting branches, simple or trifoliolate leaves, and white, pink, violet, or scarlet flowers, found in the West Indies and South America. The pulp of *T. jarowa* is eaten, and poultices are prepared from it. The fruit of *T. albiflorum* of Jamaica is also employed for poultices. The berry of *T. lilacinum* of Guiana is edible. It is used for dyeing cotton cloth and straw furniture.

Tanais. See DON.

Tanagers (*Tanagridæ*), a family of the Passeriformes, or perching birds, containing nearly 400 species; the bill is usually conical (sometimes depressed or attenuated), more or less triangular at the base, with the cutting edges not much inflected, and frequently notched near the tip of the upper mandible. This last character will generally serve to distinguish the tanagers from the finches, to which they are very closely allied; while on the other hand they have strong affinities to the American warblers (*Mniotiltidæ*). They are mostly birds of small size, the largest barely exceeding a song thrush, and the smallest, some of the genus *Euphonia,* being hardly four inches in length. This genus, with its ally *Chlorophonia,* is remarkable in having no gizzard; the birds belonging thereto feed chiefly on ripe fruits, which, with insects, form the principal food of the typical tanagers; some, however, feed on seeds and grain, like the finches. With the exception of a few species which visit North America in summer, the tanagers are confined to Central and South America and the West Indies. Some genera of tanagers are remarkable for their beauty of plumage, which is sometimes confined to the male sex, and sometimes possessed by the female also. Many are also pleasant songsters, such as the organist tanager (*Euphonia musica*) of San Domingo; the male of this species has the upper parts purplish-black, the cap blue, and the forehead, rump, and under parts yellow; the female being olive-green, with a blue cap, and lighter and yellowish below. The scarlet tanager (*Pyranga rubra*), visiting the E. parts of North America in summer, and ranging S. in winter to Ecuador, Peru, and Bolivia, is also a songster; it is larger than the preceding species, and the male is scarlet, with black wings and tail, while the female is olive, with the wings and tail brown. Tanagers do well in captivity, and several species may usually be seen in zoölogical gardens.

Tanagra, the type genus of the family *Tanagridæ,* with 12 species, ranging from Mexico to Bolivia and La Plata.

Tanagridæ, a family of Fringilliformes formerly made a sub-family of *Fringillidæ,* with 43 genera, almost peculiar to the Neotropical region, only one genus extending into the Eastern United States and the Rocky Mountains. Primaries nine; bill usually conical, sometimes depressed or attenuated, usually more or less triangular at base, and with the cutting edges not much inflected, sometimes toothed or notched; legs short, claws curved.

Tanais, cheliferous slaters; a genus of cursorial *Isopods,* with certain affinities to the *Macroura* and to the *Amphipoda.* They have a carapace, the lateral parts of which are very vascular, and are used for respiration. The first pair of legs are converted into chelæ, the six other pairs being simple. The male is dimorphic.

Tanaro (-nä'rō), a river known anciently as Tanarus. It rises in the Ligurian Alps, in Northwestern Italy, flows past Asti and Alessandria, and empties into the Po 10 miles N. E. of Alessandria; length 125 miles.

Tanchelmians, or **Tanquelinians,** a fanatical sect which arose in the Netherlands, under the leadership of Tanchel or Tanquelin, who, about 1115, proclaimed that he was the Son of God, and caused churches to be erected in his honor. After leading a licentious life for some years, he was killed at Antwerp in 1125. His followers were restored to the Church by the instrumentality of St. Norbert, the founder of the Præmonstratensians.

Tancred, a hero of the first crusade; son of the Marquis Odo the Good and of Emma, Robert Guiscard's sister; born in Sicily in 1078; in 1098 assumed the cross, and with his cousin Bohemond set out on the crusade. Through the Byzantine empire they marched to Constantinople, whence Tancred crossed the Bosporus disguised as a common soldier, that so he might escape from swearing allegiance to the emperor. Alexios followed the Crusaders, and Tancred reluctantly, yielding to Bohemond's counsel, took the required oath. At Dorylaion (July 4, 1097) his bravery saved the camp of priests and women; his banner was the first to float from the towers of Tarsus, though Baldwin's jealousy dislodged it thence. In the siege of Antioch he slew, say chroniclers, 700 infidels; with Robert of Normandy he first set foot in the Holy City July 15, 1099. Appointed by Godfrey de Bouillon prince of Galilee, he founded churches in Nazareth, in Tiberias, and on Mount Tabor, and helped at Ascalon to guard the new Christian kingdom against the Fatimite caliph. His efforts on Godfrey's death (1100) to secure the crown of Jerusalem to Bohemond only roused Baldwin's jealousy again; but his own principality he held successfully against both Turks and Greeks, even Edessa owning his supremacy. He was busy with plans for bringing the Syrian chieftains under his sway, when he died in Antioch of a wound received in battle (1112). Valiant and, for the age in which he lived, humane, Tancred stands forth as type of "a very gentle perfect knight"; in him was embodied the chivalrous spirit of the Crusade.

Tandah, a town in the district of Fyzabad, Oude, British India; 3 miles from the Ghogra river; 60 miles S. W. of Lucknow. It is the seat of the largest weaving colony in the province, who manufacture both coarse cloth and fine muslin.

Tandy, James Napper, an Irish patriot; born in Dublin in 1740; became a prosperous and popular merchant there. One of the chief Protestant leaders of the popular interest, he took an active part in corporation politics, the free trade agitation, and especially in volunteering affairs, and became the first secretary to the United Irishmen of Dublin. Early in 1792 he challenged the solicitor-general, Toler, for his abusive language, and was ordered to prison till the close of the session by the House of Commons for breach of privilege. As the viceroy had proclaimed him, with a reward for his apprehension, he had the temerity to raise a formal action for illegality against him and his privy-councillors, which was dismissed at the final hearing on Nov. 26. For distributing in County Louth a "seditious" pamphlet against the corruption of the powerful Beresford family he was about to be tried at the Dundalk assizes in the spring of 1793, when the government discovered the graver matter that he had met the Defenders at Castle Bellingham in County Louth, and taken their oath, with the view of effecting a coalition between them and the United Irishmen. Tandy fled to the United States, lived awhile in Wilmington, Del., and crossed to France in the spring of 1798, where Madden assures us he was raised to the rank of a general of division in the French army. He followed the ill-fated invasion of Ireland, and made a futile landing at Rutland Island, Sept. 16, 1798, but returned on board that same night. He made his way to Norway, thence to Hamburg, the senate of which handed him over to the English government. On Feb. 12, 1800, he was put on trial at Dublin, but acquitted. But he was detained in custody, and again put on trial (April 7, 1801) at Lifford, in County Donegal, for the treasonable landing on Rutland Island. This time he was convicted and sentenced to death, but, from the same motives of policy that engendered the peace of Amiens (March 27, 1801), was permitted to make his way to France. He spent the rest of his days at Bordeaux, dying there in 1803.

Taney, Roger Brooke, an American statesman; born in Calvert co., Md., March 17, 1777; was graduated at Dickenson College in 1795; admitted to the bar in 1799, and elected to the house of delegates in the autumn of the same year. During the war with Great Britain he led the wing of the Federal party that upheld the policy of the government. In 1816 he was sent to the State senate; in 1827 became attorney-general of Maryland and in December, 1831, succeeded John M. Berrien as attorney-general of the United States. He was appoint-

ed Secretary of the Treasury under President Jackson on Sept. 24, 1833, but was forced to resign the next year, owing to his action with regard to the removal of the treasury deposits. On Dec. 26, 1835, however, he was nominated Chief-Justice of the United States and confirmed by the United States Senate on March 15, 1836. While in this office he rendered decisions on many important cases, notably those of Dred Scott, and Sherman M. Booth, both bearing on the Fugitive Slave Law. He died in Washington, D. C., Oct. 12, 1864.

Tanganyika (-yē'kä), a lake of Central Africa, to the S. of Lake Albert Nyanza. It extends from about lat. 3° 25′ to 8° 40′ S., and from lon. 29° 20′ to 32° 20′ E. It is 420 miles long, has an average breadth of about 30 miles, and is 2,700 feet above the level of the sea. The basin in which it lies is inclosed by an almost continuous series of hills and mountains. It is fed by numerous rivers and streamlets, and discharges by the river Lukuga into the Kongo. There are several London Missionary Society stations on Tanganyika, and on the E. shore is the Arab town of Ujiji. A carriage road, 210 miles, runs to Nyassa. Tanganyika was discovered by Speke and Burton in 1858.

Tangent, in geometry, a straight line which meets or touches a circle or curve in one point, and which, being produced, will not cut it. In Euclid (III. 16, Cor.) it is proved that any line drawn at right angles to the diameter of a circle at its extremity is a tangent to the circle.

In trigonometry, the tangent of an arc or angle is a straight line, touching the circle of which the arc is a part at one extremity of the arc, and meeting the diameter passing through the other extremity; or it is that portion of a tangent drawn at the first extremity of an arc, and limited by a secant drawn through the second extremity. The tangent is always drawn through the initial extremity of the arc, and is reckoned positive upward, and consequently, negative downward. The tangent of an arc or angle is also the tangent of its supplement. The arc and its tangent have always a certain relation to each other, and when the one is given in parts of the radius, the other can always be computed by means of an infinite series. Tables of tangents for every arc from 0° to 99°, as well as of sines, cosines, etc., are computed and formed into tables for trigonometrical purposes. Two curves are tangent to each other at a common point, when they have a common rectilinear tangent at this point. A tangent plane to a curved surface is the limit of all secant planes to the surface through the point. The point is called the point of contact. Two surfaces are tangent to each other when they have, at least, one point in common; through which, if any number of planes be passed, the sections cut out by each plane will be tangent to each other at the point. This point is called the point of contact. Another definition is this: Two surfaces are tangent to each other when they have a common tangent plane at a common point. This point is the point of contact.

Artificial tangents, tangents expressed by logarithms. Methods of tangents, the name given to the calculus in its early period. When the equation of a curve is given, and it is required to determine the tangent at any point, this is called the direct method of tangents, and when the subtangent to a curve at any point is given, and it is required to determine the equation of the curve, this is termed the inverse method of tangents. These terms are synonymous with the differential and integral calculus. Natural tangents, tangents expressed by natural numbers. To go (or fly) off at a tangent, to break off suddenly from one course of action, line of thought, or the like, and go on to something else.

Tangent Scale, a species of breech sight for cannon. Its base has a curvature corresponding to the circumference of the breech of the gun, and its face is cut into steps corresponding to angles of elevation. The height for each step is found by multiplying the natural tangent of the elevation in degress by the distance between the base ring and muzzle sight.

Tangermann, Wilhelm (täng'er-män), pseudonym VICTOR GRANELLA, a German theological writer; born in Essen on the Ruhr, July 6, 1815. He was a priest of the Roman Catholic Church, but on the fulmination of the Vatican degree of infallibility, he seceded from that communion and became pastor of a schismatical church in Cologne. He wrote: "Truth, Beauty, and Love," a series of philosophico-æsthetic studies (1867); "From Two Worlds: Truth and Fiction" (1871); "Philosophy and Christianity" (1876); "New Springtime, New Life" (1889); "Flowers and Stars," poems (1896).

Tanghin (*Tanghinia venenifera*), a tree of Madagascar, natural order *Apocynaceæ*, bearing a fruit the kernel of which, about the size of an almond, is highly poisonous. Trial by tanghin was formerly used in Madagascar as a test of the guilt or innocence of a suspected criminal. The person undergoing the ordeal was required to swallow a small portion of the kernel. If his stomach rejected it he was deemed innocent, but if he died, as happened in most cases, he was deemed to have deserved his fate and suffered the punishment of his crime.

Tangier (tän-jēr'), **Tangiers** (tän-jērz'), or **Tanja,** a seaport and the diplomatic capital of Morocco; near the entrance of the Strait of Gibraltar. It stands on a height

near a spacious bay and presents a very striking appearance from the sea. It is the principal center of commerce in Morocco, has considerable trade with Europe and is the residence of the foreign consuls and diplomatic corps. Tangier is said to have been founded by the Carthaginians, from whom it passed successively to the Goths and Arabs. It was taken from them by the Portuguese in 1471, by whom it was ceded to the British in 1662 as a part of the dowry of Catharine of Braganza on her marriage with Charles II. It was abandoned to the Moors in 1684, bombarded by the Spaniards in 1790, and by the French in 1844. Pop. about 30,000.

Tangier Island, an island of Virginia, in Chesapeake Bay, nearly opposite the mouth of the Potomac river. N. of this island extends a range of islands mostly in Somerset co., Md., dividing Tangier Sound from the rest of the bay. This sound is noted for its oysters.

Tangle, a common name for *Laminaria digitata* and *L. saccharina,* two large *Algæ,* with plain ribless fronds, found on the coasts of N. seas growing on rocks exposed only at low tides, but often found washed ashore. Formerly tangle was largely collected for kelp, and is still used under Stanford's process for manufacturing seaweed products. It also serves for manure and for feeding cattle. The young stems and fronds of *L. saccharina* are still sometimes brought to market as an article of food.

Tanhauser. See TANNHÄUSER.

Tanis, an ancient Egyptian city in the N. E. of the Delta, once the chief commercial city of Egypt, capital of the Hyksos kings about 2100 B. C., and of Rameses II., and other great monarchs of the 19th dynasty. Its prosperity was destroyed by the silting up of the Tanitic mouth of the Nile, which was named from it, and it was destroyed for rebellion in A. D. 174. The ruins near the fishing village of Sân el Hager near the S. shore of the Lake of Menzaleh were examined first by Mariette, and in 1883–1884 explored by Flinders Petrie.

Tanistry, a mode of tenure among various Celtic tribes, according to which the tanist or holder of lands or honors had only a life estate in them, and his successor was appointed by election. According to this system the right of succession was hereditary in the family, but elective in the individual. The primitive intention seems to have been that the inheritance should descend to the most worthy of the blood and name of the deceased. This was in reality giving it to the strongest, and the practice often occasioned bloody wars in families.

Tanjore (native, Tanjúr, or Tanjávúr), a town of India, capital of a district in the Madras province, 180 miles S. S. W. of Madras city, in the midst of an extensive plain, on one of the branches of the lower Kaveri. The principal edifices of Tanjore are the palace of the old rajahs, a dismantled fort and the Great Pagoda. This last has a perpendicular part two stories in height, 82 feet square, and above that 13 stories, forming an elongated pyramid about 100 feet high. The basement section is simple in outlines, but adorned by niches and pilasters; the pyramidal portion is somewhat elaborately sculptured; and the whole is crowned by a dome (said to consist of a single stone), which brings the total height to 190 feet. The temple stands in one of two great courtyards, and in the same court stand several small shrines, one of which is so beautifully carved as to rival in interest the great temple. The date of the latter is not certainly known, but is with much probability referred to the beginning of the 14th century. Silks, jewelry, carpets, copper vessels, and artistic models in clay, etc., are manufactured. Pop. (1901) 57,870.

Tankite, a massive mineral found at Arendal, Norway, and said to be related to chiastolite, but Des Cloizeaux and Pisani (the former from its optical characters, the latter from its chemical composition) refer it to anorthite.

Tank Worm, the Guinea worm in a certain stage of its development, when the young have been set free from the body of their parent and inhabit the "tanks" so common in India. It is supposed that it penetrates the body of bathers when it is very minute.

Tann, Ludwig, Freiherr von, a German military officer; born in Darmstadt June 18, 1815; entered the Bavarian service as lieutenant in 1833. In 1840 he became 1st lieutenant of the staff, and in 1844 of the adjutant to the Crown-Prince Maximilian, whom he accompanied on his travels in Greece. In 1848 he led a troop of volunteers in the revolt of Schleswig-Holstein against Denmark, and distinguished himself at Hoptrupp and at Düppel. Shortly before the conclusion of the war he returned to Bavaria, where he became successively colonel in 1850, Major-General in 1855, general adjutant of the king in 1859, and in 1860 Lieutenant-General and Commander of Division. In the war of 1866 he acted as chief of the staff of Field-Marshal Prince Karl, and in 1869 became General of Infantry with the command of the 1st Bavarian Army Corps, which took a distinguished part in the battles of Wörth, Beaumont, Sedan, and Orleans. He was, however, forced to retreat from Orleans, and received on Nov. 9, a severe defeat from General Aurelle, losing 10,000 prisoners and two guns, and being driven back to Artenay. The arrival of reinforcements under the Grand-Duke of Mecklenburg enabled the German

army to recover its position, and Tann earned fresh glory for himself at Baroches-les-Hautes, Orleans and Beaugency. After the war he resided at Munich as general-commandant of the 1st Army Corps. He died in Meran, Tyrol, April 26, 1881.

Tanna, one of the New Hebrides islands, in the Pacific Ocean; 18 miles long by 8 wide; pop. 10,000.

Tannah, the chief town of the district of the same name, in the Bombay presideney, British India, 24 miles N. E. of Bombay. The first railway in India was opened from Bombay to Tannah in 1853.

Tannahill, Robert, a writer of Scotch songs; born in Paisley, Seotland, June 3, 1774. His parents were in humble life, and he was himself bred to the occupation of a weaver. In 1807 the first edition of his "Poems and Songs" was published, and was reeeived very favorably by the publie. A sceond edition, earefully revised, whieh he had prepared for the press, was refused by Constable of Edinburgh, and this tended to inerease the melancholy from whieh he had been suffering; on May 17, 1810, he committed suieide by drowning.

Tannaspidic Acid, $C_{26}H_{28}O_{11}$(?); a brown, shining amorphous mass, found in the root of the male fern. It is insoluble in water, ether, oil of turpentine, and fixed oils, but very soluble in strong aleohol, and in warm aeetic acid. Ferric ehloride eolors the aleoholic solution green, and on adding ammonia a greenish powder is preeipitated.

Tannenite, a bright metallic mineral of a tin-white eolor, erystallizing in the orthorhombie system. Composition: Sulphur, 19.1; bismuth, 62.0; copper, 18.9, the resulting formula being $CuS+Bi_2S_3$.

Tanner, Benjaman Tucker, an Amerieaan elergyman; born of Afriean parents in Pittsburg, Pa., Dec. 25, 1835; studied theology in the Western Theologieal Seminary, in Holland, Mieh.; was editor of the "Christian Recorder" for 16 years, and founded the African Methodist Episeopal "Chureh Review," of whieh he was editor for four years. He was ordained a bishop in 1888, and was the author of "The Origin of the Negro"; "The Negro in Holy Writ"; "What?"; etc.

Tanner, Henry S., an American cartographer; born in New York eity in 1786; settled in Philadelphia in early life, but returned to New York in 1850, and engaged in map making. His maps include the "New American Atlas"; "Map of the United States and Mexico"; "The World"; "Map of Philadelphia," and "Map of the United States of Ameriea." He was also the author of "Memoir on Recent Surveys in the United States"; "Description of the Canals and Railroads of the United States," and other topographical works. He died in New York city in 1858.

Tanner, James, an American lawyer; born in Richmondville, N. Y., April 4, 1844; enlisted as a private in the 87th New York Volunteers in 1861; was promoted corporal; and took part in the second battle of Bull Run, where he lost both his legs. He was taken prisoner in the engagement but was soon paroled and in 1866 returned to New York; studied law; and was admitted to the bar in 1869. He then accepted a place in the New York eustom house, was promoted through the various grades to deputy colleetor, and in 1877 beeame deputy tax colleetor under General Arthur. He held that offiee till 1885, and in 1889 was appointed United States Commissioner of Pensions. Subsequently he became a pension attorney.

Tanner, Thomas, an English clergyman; born in Market Lavington, Wiltshire, England, Jan. 25, 1674; after graduating from Queen's College, Oxford, was in 1696 eleeted a Fellow of All Souls. He had already a high reputation as an antiquary, and Wood at his death in 1695 left him the eare of his papers. He took orders, and beeame in sueeession ehaplain to his father-in-law, Bishop Moore of Norwieh, ehaneellor of Norwieh, prebendary of Ely, reetor of Thorpe near Norwich, arehdeaeon of Norwieh (1710), eanon of Christ Chureh, Oxford (1723), and Bishop of St. Asaph (1732). An improved and enlarged edition of his "Notitia Monastiea" (on Monasteries 1695), appeared in folio under the eare of his brother in 1744. But Bishop Tanner's fame rests hardly less seeurely on his great posthumous biographieal and bibliographieal work — the labor of 40 years, "Bibliotheca Britannieo-Hibernica" (British Hibernian Library, ed. by Dr. D. Wilkins, 1748). His edition of Wood's "Athenæ Oxonienses" (The Oxonian Atheno), he had published in two volumes, folio, in 1721. He died in Oxford Dec. 14, 1735. See WOOD, ANTHONY.

Tannhäuser, or **Tanhäuser** (tän-hoi'zer), in old German legend, a knight who gains admission into a hill ealled the Venusberg, in the interior of whieh Venus holds her eourt, and who for a long time remains buried in sensual pleasures, but at last listens to the voiee of the Virgin Mary, whom he hears ealling on him to return. The goddess allows him to depart, when he hastens to Rome to seek from the Pope (Pope Urban) absolution for his sins. The Pope, however, when he knows the extent of the knight's guilt, deelares to him that it is as impossible for him to obtain pardon as it is for the wand which he holds in his hand to bud and bring forth green leaves. Despairing, the knight retires from the presence of the pontiff, and enters the Venusberg once more. Meanwhile the Pope's wand actually begins to sprout, and the Pope, tak-

ing this as a sign from God that there was still an opportunity of salvation for the knight, hastily sends messengers into all lands to seek for him. But Tannhäuser is never again seen. The Tannhäuser legend has been treated poetically by Tieck, and Richard Wagner has adopted it (with modifications) as the subject of one of his operas.

Tannic Acid, tannin, a term applied to certain astringent substances occurring in the bark and other parts of plants, and widely distributed, in one form or another, throughout the vegetable kingdom. They are mostly amorphous,, have a rough but not sour taste, a slight acid reaction, and color ferric salts dark blue or green. Their most characteristic reaction is that of forming insoluble compounds with gelatin, solid muscular fiber, skin, etc., which then acquires the property of resisting putrefaction, as in the tanning of leather.

Tanning. See LEATHER.

Tanrec. See TENREC.

Tansa, a small river whose valley has been, at a point 65 miles N. of Bombay, impounded by the largest masonry dam in the world, for the water-supply of Bombay. The embankment, a little short of 2 miles long, is 118 feet high and 100 feet thick at the bottom, and contains over 11,000,000 cubic feet of masonry — all solid stone. The area of the dam is about 8 square miles, and the water supply is equal to about 100,000,000 gallons per day. The works kept on an average from 9,000 to 12,000 workpeople engaged for 5½ years; and the water was turned on by the viceroy, March 31, 1892.

Tansillo, Luigi (tän-sil'lō), an Italian poet; born in Venosa, Italy, in 1510. His early poems are: "The Two Pilgrims," a pastoral; "The Vintager" (1532); and some amorous rhymes probably addressed to Maria of Aragon. To his later years belong the "Balia"; the "Podere" (1560); an idyl on the charm of country life; and "St. Peter's Tears," a religious work written by way of atonement for "The Vintager." He died in Teano, Dec. 1, 1568.

Tansy (*Tanacetum*), a genus of *Compositæ,* numbering about 50 species of strong-scented herbs, often shrubby below, with alternate usually much-divided leaves, and solitary or corymbose heads of rayless yellow flowers. The genus is represented in Europe, North and South Africa, temperate and cold Asia, and North America. Common tansy (*T. vulgaris*) has long had a reputation as a medicinal herb, causing it to be much grown in gardens in the past. It possesses bitter, tonic, vermifuge, and febrifuge properties. The plant is a native of Northern Europe, Siberia, and Northwest America, and occurs in a wild state in Great Britain, but as met with along the sides of streams, etc., is often of garden origin. It now holds a place in gardens mainly for the young leaves, which are shredded down

TANSY.

and employed to flavor puddings, omelets and cakes. A variety with leaves doubly curled is generally preferred.

Tantah, a town of Lower Egypt; on the railway about 50 miles N. of Cairo. It has many large public buildings, besides a palace of the Khedive, and is celebrated in connection with the Great Moslem saint Seyyid-el-Bedawi, to whom a mosque is here erected. Tantah has three great annual fairs, which are held in January, April, and August, and at the latter 500,000 persons are said to congregate from the surrounding countries. Pop. (1907) 54,437.

Tantalem Island, an island in the Gulf of Siam, on the E. coast of the main peninsula, from which it is separated by a narrow strait; 65 miles long by 20 wide.

Tantalic Chloride, $TaCl_5$; obtained as a yellow sublimate when a mixture of tantalic oxide and charcoal is ignited in a stream of chlorine gas. It is decomposed by water yielding hydrochloric acid and hydrated tantalic oxide. Heated to 144°, it volatilizes, and at 221° melts to a yellowish liquid.

Tantalic Ocher, an oxide of tantalum of a brownish color, said to occur on crystals of tantalite at Pennikoja, Somero, Finland.

Tantalic Oxide, Ta_2O_5; produced by burning tantalum in the air. The anhydrous oxide is a white powder, varying in density from 7.02 to 8.26, and is insoluble in all acids. Hydrated tantalic oxide, or tantalic acid, is obtained by adding water to an aqueous solution of potassium tantalate. It is a snow-white, bulky powder, soluble in hydrochloric and hydrofluoric acids.

Tantalidæ, a family of grallatorial birds, the chief of which inhabit tropical latitudes, living almost entirely on the swampy banks of rivers and lakes. The genus *Tantalus* is characterized by having the head in the adult entirely destitute of feathers. It includes the wood ibis (*T. loculator*) of the Southern States, is 45 inches long, the wing 18 inches; the color white, quill and tail a metallic blackish-green. They live in flocks in the swampy districts, feeding on fish and aquatic reptiles. The genus *Ibis* has the bill very long, moderately thickened at the base, and curves downward toward the tip. Among the American species are the red or scarlet ibis (*I. rubra*) of South America and the West Indies, accidentally in the United States; and the white ibis, or white curlew (*I. alba*) of the South Atlantic and Gulf States, rarely N., which is 25 inches long, the wing 11, and the bill 7 inches; color white. This species feeds largely on crawfish. The sacred ibis, or Egyptian ibis (*I. religiosa*), is an African bird, 30 inches in length, and covered with white and black plumage. It was one of the birds worshiped by the ancient Egyptians, and called by them *Hae,* or *Hib,* and by the modern Egyptians *Abou-Hannes* (*i. e.* Father John). It was supposed, from the color of its feathers, to symbolize the light and shade of the moon, and its body to represent the heart; its legs described a triangle, and with its beak it performed a medical operation; from all which esoterical ideas it was the avator of the god Thoth and Hermes, who escaped in that shape the pursuit of Typhon, as the hawk was that of Ra, or Horus, the sun. Its feathers were supposed to scare, and even kill, the crocodile. It appeared in Egypt at the rise, and disappeared at the inundation of the Nile, and was thought, at that time, to deliver Egypt from the winged and other serpents which came from Arabia in certain narrow passes. As it did not make its nest in Egypt, it was thought to be self-engendering and to lay eggs for a lunar month. According to some, the basilisk was engendered by it. It was celebrated for its purity, and only drank from the purest water, and the most strict of the priesthood only drank of the pools where it had been seen; besides which, it was fabled to entertain the most invincible love of Egypt, and to die of self-starvation if transported elsewhere. Its flesh was thought to be incorruptible after death, and to kill it was punishable with death.

Tantalite, an orthorhombic mineral of rare occurrence, found in granitic rocks rich in albite or oligoclase; hardness, 6–6.5; sp. gr. 7–8; luster, metallic; color, black; streak, reddish-brown to black; opaque, brittle. Composition: A tantalate of the protoxides of iron and manganese, part of the tantalic acid being sometimes replaced by oxide of tin, forming a stanno-tantalate. Formula, $(FeOMnO)$, TaO_5.

Tantalum, a pentad metallic element, symbol, Ta., at. wt. 182, discovered in 1803 by Ekeberg in the minerals tantalite and yttrotantalite. The metal is obtained by heating the fluotantalate of potassium or sodium with metallic sodium in a covered iron crucible, cooling, and washing out the soluble salts with water. It is a black powder, insoluble in sulphuric, hydrochloric, nitric, or even in nitrohydrochloric acid, but is slowly dissolved in warm aqueous hydrofluoric acid, very rapidly when nitric acid is present. When heated in the air, it burns with a bright light, being converted, though with difficulty, into tantalic oxide.

Tantalus, in Greek mythology, a King of Lydia, son of Zeus. He was father of Niobe and Pelops, by Dione, one of the Atlantides, and is represented by the poets as punished in Hades with an insatiable thirst, and placed up to the chin in the midst of a pool of water, which flowed away as soon as he attempted to taste it. There hung also above his head a bough, richly loaded with delicious fruit, which, as soon as he attempted to seize it, was carried away from his reach by a sudden blast of wind. He was thus punished either for theft, cruelty, and impiety, or lasciviousness; for the causes are variously stated.

Tantia Topi ("the weaver who became an artilleryman"); the most energetic of the rebel ringleaders during the Sepoy Mutiny of 1857. He commenced as a lieutenant of Nana Sahib, of whom he is said to have been a relation; but after the latter had fled into Nepal, he continued the war for several months, retreating with great rapidity through Bundelcund and Central India, but was finally captured, tried, and hanged in April, 1859. He was the last armed rebel in the field.

Tantra, in Hindu sacred literature, one of the compositions, great in number and in some cases extensive, always assuming the form of a dialogue between Siva and his bride in one of her many forms, but chiefly as Uma and Parvati, in which the goddess asks her consort for directions how to perform certain ceremonies, and with what prayers and incantations they should be accompanied. In giving her information, he warns her that it must on no account be divulged to the profane. The Tantrikas, or followers of the Tantras, consider them a fifth Veda, and attribute to them equal antiquity and superior authority. Prof. Horace Hayman Wilson believed that portions of them are older than the Puranas, and that the system originated in the early ages of Christianity. They were composed chiefly in Bengal and Eastern India. The Saktas are great supporters of the Tantras. See Sakta.

Tantum Ergo, the hymn sung in the Roman Catholic Church at benediction with the Holy Sacrament.

Tanypus, in entomology, a genus of *Tipulidæ.* Antennæ with 14 articulations in both sexes, the last but one very long in the males, all the others nearly globular.

Tanysiptera, in ornithology, a genus of *Alcedinidæ,* with 14 species, from the Moluccas, New Guinea, and North Australia. Bill rather short, somewhat thick, straight, acute; nostrils oval; tail graduated, the two middle feathers the longest.

Tanystoma, in entomology, a tribe of *Diptera,* with several families. The antennæ consist apparently of three joints, but often with indications of articulation in the third joint, and with a terminal bristle; the palpi of not more than two joints, and the mouth usually perfect. The larvæ have a more or less distinct head, and produce free pupæ.

Taoism, or **Taonism,** one of the three religions of China. Its founder, Laotse, lived, according to tradition, in the 6th century B. C. Tao is a word meaning "way." It would seem that Tao represented the course which Laotse thought a man should pursue in order to overcome evil. The whole teaching was vague and unsatisfactory; but its followers made a great advance on those that had preceded them, by believing firmly that ultimately good would gain the victory over evil, and by insisting that good should be returned for evil, as the sure way to overcome it. The head of the body was a sort of patriarch, who had the power of transmitting his dignity and office to a member of his own family, and the descendants of the first are said to have held the office for centuries. Tao was afterward personified, and regarded as the first being of the universe. The Taoists attributed to him eternity and invisibility; but they do not seem to have regarded him as being in any way able to assist or comfort his followers. All they had to do was to contemplate him and his virtues, and to strive to keep in the "way." When Taoism appears as a definite factor in the history of China, in the 3d century B. C., it appears as a congeries of superstitions; belief in the manifestations of spirits, alchemy, astrology, searching for the herb of immortality, and the sublimation of the body so as to render it ethereal. Taoism was largely modified by Buddhism, some of the doctrines and practices of which it adopted; but it still adheres to its old superstitions, though in its treatises it enjoins much of the Confucian and the Buddhistic morality.

Taormina, a town on the E. coast of Sicily; on a lofty rock 900 feet above the sea; 35 miles S. W. of Messina. It has numerous relics of antiquity, as an aqueduct, tesselated pavements, and the remains of a theater, reckoned one of the most splendid ruins in Sicily, and commanding a view of almost unparalleled magnificence. Taormina (ancient Tauromenium), founded by the Siculi in the 4th century B. C., was long a Roman possession. It was taken by the Saracens in 902 and 962, by the Normans in 1078, by the French in 1676, and in 1849 by the Neapolitans under Filangieri.

Taos, the most N. of the Pueblo tribes of North American Indians. They live in New Mexico, in a village of the same name, on the Rio de Taos, 50 miles N. of Santa Fé, and number about 400.

Tapajos, a river of Brazil, rises in the Serra Diamantina, 20 miles from the headwaters of the Paraguay, and after a N. course of 1,100 miles, joins the Amazon in lon. 35° W. The Tapajos is a dark, wide stream, and is navigable throughout most of its length. Steamers ply on its lower course for several hundred miles.

Tapalpite (after the Sierra de Tapalpa, Mexico, where found) supposed to be a sulpho-telluride of bismuth and silver, but its exact composition has not yet been determined; structure, granular; sp. gr. 7.803; luster, metallic; color, gray, tarnishes easily. An analysis by Rammelsberg yielded: Sulphur, 3.32; tellurium, 24.10; bismuth, 48.50; silver, 23.35 = 99.27.

Tapayaxin, *Phrynosoma orbiculare,* a toad-like lizard, about six inches long, from the hill-country of Central Mexico. There are eight sharp radiating spines on the back of the head, and rows of scales keeled and spined on the flanks. General color, a dull sand-tint above; yellowish beneath.

Tapestry, an ornamental textile used for the covering of walls and furniture, and for curtains and hangings. In its method of manufacture it is intimately related to Oriental carpets, which are made in precisely the same way as certain kinds of tapestry, the only distinction being that carpets are meant for floor-coverings alone. Fine storied tapestries are, however, much more elaborate and costly than any carpets, and they have altogether different artistic pretensions. Tapestries are divided into two classes, according as they are made in high warp or low warp looms. The former in manufacture have their warp threads stretched in a vertical manner with a roller at the top around which the warps are wound, and another at the bottom for receiving the finished tapestry. On the low warp looms the warp is extended horizontally, there being an arrangement in both for shedding or separating the warp into two leaves, front and back, as in ordinary weaving. It is in high warp looms that the most elaborate storied or pictorial tapestries are made, low warp looms being more

largely devoted to the production of still life and non-pictorial decorative compositions. Notwithstanding these differences, it is difficult to distinguish between tapestries which have been made on high and low warp looms respectively, though the latter are more rapidly and consequently less expensively woven.

In reproducing a design on the high warp loom the workman has the portion of the cartoon he is copying behind him. He works from the back or wrong side of the tapestry, and to guide him the outline of the subject is slightly indicated on the warp threads. He has an endless number of shades and tones of wool and silk (formerly gold and silver threads were also used) which, with little shuttles, he shoots through the number of warp threads required for each particular shade, and with such wefts he covers and entirely encloses the warp threads. In the reproduction of a design the utmost skill and experience are essential, not only to outline the figures and composition generally with accuracy, but also for the proper grading and hatching in of tones to secure the rich and mellow harmonies which constitute the principal charms of a picture. In low warp tapestry weaving the design to be copied is placed under the warp, and, as the workman here also weaves from the back, the design is reversed in the finished production. Of late years only it has become the habit to trace a reverse drawing on the warp threads, whereby the tapestry is made to show the design as originally composed. The difficulty of examining low warp work as it proceeds prevents the elaborate and delicate work being produced by this method which it is possible to secure on high warp looms.

The art of tapestry-working is of high antiquity, and it may be that the curtains of the tabernacle "of blue and purple and scarlet, with cherubim of cunning work" (Exod. xxvi: 1), were a kind of tapestry, though more probably they were of needle work. The so-called Bayeaux Tapestry is really embroidered work of the period of William the Conqueror. The art of tapestry working, and indeed all fine weaving, came to Europe from the East, and so well was this recognized that during the Middle Ages the fabric was generally known as *Sarrazinois*. So far as is known the art of high warp tapestry weaving was first practised in Flanders toward the end of the 12th century, and it flourished in the rich and prosperous towns of Arras, Valenciennes, Lille, Brussels, etc., and from the predominant importance of the first of these towns storied tapestries came to be generally known as "Arras." The disasters which overwhelmed the land during the contest with the Spanish power led many of the most skillful of the tapestry weavers to seek an asylum in foreign lands, and thus the art spread to various European centers. Repeated attempts had been made in France from the middle of the 16th century onward to establish the industry, but it was not till two Flemish workers, Comans and De la Planche, were engaged for an establishment formerly occupied by a family of wool dyers called Gobelin, that the industry was successfully founded and the famous Gobelins factory begun.

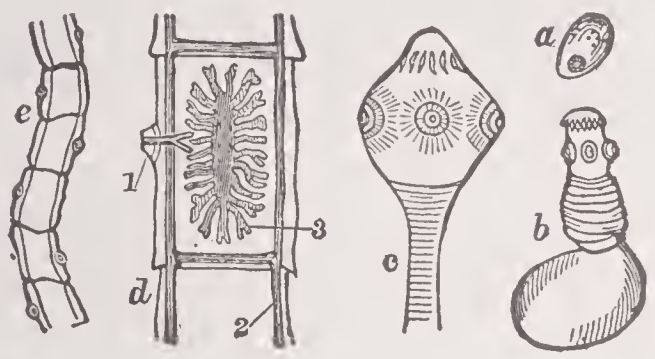
From the early part of the 17th century to the present day the Gobelins has continued to be the source of the richest and most artistic of high warp tapestries anywhere produced, and indeed that establishment may be regarded as the only source of fine storied tapestries of modern times. The manufactures of the Savonnerie, an establishment founded by Henri IV. for velvet-pile carpets and hangings, was in 1826 combined with the Gobelins, and the two industries are now carried on together by the State. There is also a State factory for low warp tapestries at Beauvais; and at Aubusson and Felletin commercial tapestries are very largely made for furniture covering, etc., in establishments which in earlier times were celebrated for their tapestries *de luxe*. Tapestries were also made at an early period in England. In 1619 an establishment was founded at Mortlake by Sir Francis Crane, and under his guidance works of the very highest merit were produced. Throughout all the troubles of the Great Rebellion period Crane's factory continued in operation, and it was only in 1703 that it was closed. In 1872 some French tapestry weavers were brought to Windsor, and a factory established there under royal patronage, which survived till 1888.

Tapestries — especially the high warp storied varieties — are the textiles of kings. In earlier times the monarchs of Europe resorted to the Netherlands for pieces for the decoration of their palaces; and when the manufacture came to be more disseminated it was almost entirely under State supervision and control that the work was carried on. The pieces made were almost exclusively reserved for royal use, and to be given as presents in connection with great State celebrations and functions. The very foremost artists devoted their best energies to the production of designs and full-sized cartoons for the guidance of the weavers; and it was as patterns for tapestry that Raphael produced the immortal series of cartoons illustrating the acts of Christ and the Apostles which were executed in Brussels for the Sistine Chapel. Seven of these cartoons, purchased by Charles I. under the advice of Rubens, are now in South Kensington Museum. It is worthy of remark that the earlier artists generally understood the conditions of tapestry design much better than the more recent painters who have sup-

plied cartoons for copying. The cartoons of the early artists were simple in motive and decorative treatment, the masses were bold and broad, and the color scheme harmonious without complexity. By modern artists the mistake was made of attempting, if not to rival, at least to copy oil paintings with all their subtle harmonies and minuteness of detail. The mistake is now recognized, and among the regulations of the Gobelins is one that no tapestries will be there produced except from approved copies or cartoons made expressly for that purpose.

Tapeti, the Brazilian hare, the *Lepus Brasiliensis,* the only hare inhabiting South America.

Tapeworm, an intestinal worm, *Tænia solium,* in form somewhat resembling tape. Its length is from 5 to 15 yards, and its



TAPEWORMS.

a, ovum with contained embryo; b, cysicercus longicollis; c, head of tænia solium (enlarged); d, a single segment or proglottis magnified; 1, generating pore; 2, water vessels; 3, dentritic ovary, e, portion of tapeworm, natural size, showing the alternating arrangement of the generative pores.

breadth from two lines at the narrowest part to four or five at the other or broader extremity. At the narrow end is the head, which is terminated anteriorly by a central rostellum, surrounded by a crown of small recurved hooks, and behind them four suctorial depressions; then follow an immense number of segments, each full of microscopic ova. The segments are capable of being detached when mature, and reproducing the parasite. There is no mouth; but nutrition appears to take place through the tissues of the animal, as algæ derive nourishment from the sea water in which they float. The digestive system consists of two tubes or lateral canals, extending from the anterior to the posterior end of the body, and a transverse canal at the summit of each joint.

The tapeworm lives in the small intestines of man, affixing itself by its double circle of hooks. When the reproductive joints or proglottides become mature, they break off and are voided with the stools. They may get into water, or may be blown about with the wind, till some of them are at length swallowed by the pig, and produce a parasite called *Cysticercus cellulosæ,* which causes measles in the pig. When the measly pork is eaten by man, a tapeworm, the ordinary *T. solium,* appears in his intestines. This species mainly affects the poor, who are the chief pork-eaters. Called more fully the pork tapeworm. The beef tapeworm, *T. mediocanellata,* has no coronet of hooks on the head. The segments are somewhat larger than in the ordinary tapeworm. It is 15 to 23 feet long. The cysticercus of this species forms measles in the ox, and is swallowed by man in eating beef. It chiefly affects the rich. The broad tapeworm, *Bothrioeephalus latus,* is 25 feet long by nearly an inch broad, and chiefly affects the inhabitants of Switzerland, Russia and Poland.

In his diagnosis of the *Tæniadæ* Professor Leuckart notes the following points: The small pear-shaped or spherical "head" bears, at some distance from the apex, four roundish suckers with powerful musculature. Between these there is usually, near the apex, a simple or manifold circle of claw-like hooks, which are supported and moved by a muscular rostellum. The "joints" or proglottides are distinctly separated from one another, are usually longer than broad, are almost always provided with marginal generative apertures, and vary in number from 3 to 3,000 to 4,000. These joints are liberated from the host with great regularity, but somewhat late, after the embryos are well developed. The uterus has no direct communication with the exterior, so that the eggs remain inside the proglottides, and are only set free when these are destroyed.

The adult sexual *Tæniadæ* live for the most part in birds and mammals, the larval "bladder worms" or *Cystieerei* occur in both higher and lower animals. In this family most zoölogists recognize only one genus, *Tænia,* but there are so many species that Leuckart finds it convenient to recognize several sub-genera.

In the *Bothriocephalidæ* the head is oval and flattened; the two suckers, devoid of special musculature, lie opposite one another longitudinally; the hooks, if present at all (*Triænophorus*), are without a rostellum; the "joints" are indistinctly separate, always broader than long, and detached in numbers; the uterus has a ventral opening through which the embryos escape; these embryos are usually ciliated and able to swim about in water; the development is more direct than in *Tæniadæ,* for a true bladder worm stage seems always wanting. The family includes a few genera — *e. g., Arehigetes, Ligula, Triæneophorus,* but the most important practically is *Bothriocephalus.*

Two *Tæniadæ* are in their adult sexual state parasitic in man: *Tænia solium,* with the bladder worm stage in the pig; *T. saginata* or *mediocanellata,* with bladder worm

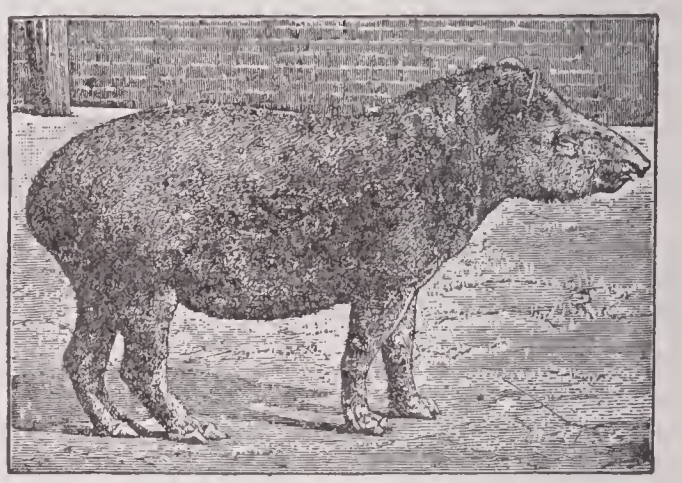
in the ox; and some others, *T. cucumerina*, *T. nana*, *T. flavomaculata*, and *T. madagascaricnsis*, occasionally occur. They infest the small intestine, and there also *Bothriocephalus latus* (larval in pike and burbot) may be found. Moreover tænioid bladder worms also occur in man, the most important being that of *T. echinococcus*, which lives as an adult tapeworm in the dog.

In the majority of cases man becomes infected with tapeworms through eating the raw or imperfectly cooked flesh of the animal — be it ox or pig or fish — which is the host of the immature stage of the parasite. In other cases filthy habits of living and eating render it readily possible for the bladder worms — or, in the case of *T. echinococcus*, the ova — to get mixed up with the food. The presence of tapeworm in the small intestine need not be dangerous — indeed, the Abyssinians regard freedom from the parasite as a disaster; but it is usually troublesome, giving rise to disturbances of digestion, colic-like pains, diarrhœa, or, on the contrary, constipation, besides less local effects, such as anæmic and neurotic states. No certain diagnosis is possible, "unless the eggs of proglottides of the *corpus delicti* be observed, and these must always be identified before so radical a cure as treatment with anthelmintics is begun." Of these anthelmintics — which are intended to expel the parasite from the intestine — there is no lack in the pharmacopœia. But, as Leuckart insists with evident reasonableness, prevention is better than cure.

Taphozous (named by Geoffroy, who discovered the type species in the chambers of the Pyramids), a genus of bats, belonging to the group *Emballonuræ* of the family *emballonuridæ*, from the Ethiopian, Oriental, and Australian regions, with 10 species ranging into Egypt and Palestine. Most of these bats have a peculiar glandular sac between the angles of the lower jaw; it is always more developed in males than in females, which, in some species, do not possess any trace of it, though in the males of the same species it may be quite distinct. In *T. melanopogon*, from India and the East Indies, it is absent from both sexes. In the seven species forming the sub-genus *Taphozous*, a small band of integument passes from the inferior surface of the fore-arm, and forms, with the wing membrane, a small pouch; in the other three species (forming the sub-genus *Taphonyctcris*) this pouch is absent.

Tapioca, the powdered root or rhizome of *Manihot utilissima* (*Jatropha manihot*). The root, which is about 30 pounds in weight, and is full of a poisonous juice, is washed, rasped, or rasped and grated, to a pulp. This, being well bruised and thoroughly washed, is heated on iron plates, by which process the poison is drawn off. The powder, when dry, consists of pure starch, and is baked into bread by the natives of Central America. In the United States and Europe it is generally made into puddings, and forms a light and nutritious diet. Pearl tapioca is made from prepared grain.

Tapir, any individual of the genus *Tapirus*. The South American tapir (*T. umericanus*) is about the size of a small ass, but



AMERICAN TAPIR.

more stoutly built, legs short, snout prolonged into a proboscis, but destitute of the finger-like process which is present in the elephant's trunk. The skin of the neck forms a thick rounded crest on the nape, with a short, stiff mane. It is plentiful throughout South America, ranging from the Isthmus of Darien to the Straits of Magellan. The color is a uniform deep brown, but the young are marked with yellow stripes and spots. There is another American species inhabiting the Cordilleras; the back is covered with hair, and the nasal bones are more elongated, on which account Gill has given it generic rank. The Malayan tapir (*T. malayanus*) is rather larger than the American species, and has a somewhat longer proboscis; it is maneless. The color is glossy black, with the back, rump, and sides white, the two colors being distinctly marked off from each other without any graduation. Tapirs inhabit deep recesses of forests, delighting in water, and feeding on young shoots of trees, fruits, and other vegetable substances. They are inoffensive, never attacking man, and are easily tamed. Their flesh is eaten, but is somewhat dry, and their hides are made into leather.

Tappan, Benjamin, an American naval officer; born in New Orleans, La., April 10, 1856; was graduated at the United States Naval Academy, June 20, 1876; and commissioned a lieutenant in January, 1886. He served in the Bureau of Naval Intelligence in 1888–1891; with the "Miantonomah" in 1891–1894; at the Brooklyn navy yard in 1895–1896; was transferred to the "Amphitrite" and later to the "Raleigh," on which he took part in the battle of Manila Bay, May 1, 1898. During the attack on

Manila city in August, 1898, he commanded the launch "Barcelo," took her through the breakers and captured a Spanish battery. For this he was advanced five numbers Aug. 23, 1898; was commissioned lieutenant-commander July 1, 1899. He was assigned to duty in the branch hydrographic office in Baltimore, Md., March 26, 1900.

Tappan, Frederick D., an American financier; born in New York city Jan. 29, 1829; was graduated at the University of New York in 1849, and in the following year became specie clerk in the National bank of New York, now the Gallatin National bank, of which he was elected president in 1868. He was president of the New York Clearing House Association for many years, and was exceptionally instrumental in enabling the banks and large business concerns of the city to successfully meet several great financial panics. He died in Lakewood, N. J., Feb. 28, 1902.

Tappan, William Bingham, an American poet; born in Beverly, Mass., in 1794. He became general agent of the American Sunday-School Union in 1826. He was author of several volumes of religious poetry; also of "New England, and Other Poems" (1819); "Songs of Judah" (1820); "Lyrics" (1822); "Poems" (1834); "Memoir of Capt. James Wilson" (1842); "Poetry of the Heart" (1847); "Late and Early Poems" (1849). He died in 1849.

Tappan Bay, or **Tappan Sea,** an expansion of the Hudson river near Tarrytown and Ossining, N. Y.; about 12 miles long and 4 wide.

Tapper, Thomas, an American musician; born in Canton, Mass., Jan. 28, 1864; was graduated at the American College of Musicians, and afterward studied in Europe. He was the author of "Chat with Music Students"; "The Music Life"; "Pictures from the Lives of Great Composers"; "Rhythm of the Fingers"; etc., and was a contributor to "Etude," Philadelphia; "Music," Chicago; "Musical Record and Review," Boston; etc.

Tappert, Wilhelm (täp'pert), a German writer on music; born in Ober-Thomaswaldau, Silesia, Feb. 19, 1830. He wrote: "Music and Musical Education" (1867); "Musical Studies" (1868); "The Wagner Lexicon" (1877), a collection of the words and phrases of contempt, disgust, etc., employed by the critics of Richard Wagner; "Poems" (1878); "Richard Wagner, his Life and Work" (1883); "Stray Melodies" (2d ed. 1890).

Tapping, in founding, the jarring of a pattern in its bed in the sand to give it clearance. With small castings this is done by sticking a skewer into the pattern, and tapping it with the slicker or trowel; with larger castings more energetic means are employed, but in the same way. In mechanics, the act or process of forming a screw thread in a hole; or boring a hole in a pipe, cask, etc., to insert a plug, connect a branch pipe, or introduce a faucet, as the case may be. In surgery, the operation of removing fluid from any of the serous cavities of the body in which it has collected in large quantity, paracentesis. It may be practised on the abdomen, the thorax, the gall-bladder, etc.

Tapti, a river of Bombay, India; rising in the Betus district of the Central Provinces, and flowing 450 miles W. through the Sātpura uplands and the districts of Candeish and Surat to the Gulf of Cambay; 17 miles below the town of Surat. Even small vessels of 40 to 50 tons burden cannot ascend higher than Surat. The port of Suwali at the mouth is now deserted, and the lower channels of the river are being silted up.

Taqua Nut, the seed or nut of the South American tree *Phytelephas macrocarpa,* introduced into Great Britain under the name of vegetable ivory, and used as ivory.

Taquarussa, in botany, the name given to some Brazilian reeds, of the order of grasses, growing from 30 to 40 feet high in the Brazilian forests, with a diameter of six inches. Between the joints they are full of a cool liquid which quenches the most burning thirst.

Tar, a product of the destructive distillation of various organic substances; but the tars of commerce are obtained 1st from the distillation of coal, etc., for gas (gas tar or coal tar), and 2d from the distillation of wood (wood tar). Gas or coal tar, which was formerly regarded as a troublesome and almost useless by-product of the gas manufacture, is now a substance of so much value that it is second only in importance to the gas itself. As obtained in gas works, gas tar is a dark colored ill-smelling heavy liquid of extremely complex chemical character, consisting of a mixture of fluid and solid hydrocarbon, acid, and basic substances. Its value in recent times has arisen almost entirely from the fact that it is the source of the wide range of important dyeing substances, which, derived from aniline, phenol (carbolic acid), and anthracene respectively, may all be classed as tar colors. Coal naptha obtained by distillation from coal tar is a mixture of several hydrocarbons of different degrees of volatility, the lightest being benzol and toluol, and the earlier part of the distillate is composed of a mixture of these two, and that part is utilized for the preparation of aniline as the basis of the aniline colors. The material remaining in the retort after the light oils are distilled over constitutes artificial asphalt, but this on

further distillation at a higher heat gives off "heavy oils," leaving in the retort pitch, a substance which when cold is hard, black, and shining, and breaks with a glassy fracture. The principal constituents of the heavy oil are carbolic acid (phenol), cresylic acid (cresol), and in the later stages of the distillatory process anthracene is obtained. All these substances are industrially important, carbolic acid not only as an antiseptic and disinfectant, but also as the basis of valuable dyes, and anthracene as the source of the now most important dyeing agent, artificial alizarine.

Wood tar is obtained as a by-product in the destructive distillation of wood for the manufacture of pyroligneous acid (wood vinegar), and methyl alcohol (wood spirit). It is in the same way obtained in Northern Europe in connection with the preparation of wood charcoal, but the greater part of the tar of commerce is obtained by a very rude and wasteful process. A pit about 9 feet deep and 10 feet of surface diameter is prepared, the sides of which are lined with clods, and into this the wood to be distilled is piled. Air is admitted to the pit by channels passing down to its lower end, and in the best constructed pits there is a pipe for conveying away the incondensible gases, and a receptacle in which the tar, etc., condense. Fir wood is principally distilled, it yielding from 13 to 14 per cent. of tar, while non-resinous wood yields not more than 9 or 10 per cent. The condensed liquid contains wood vinegar and oil of turpentine; and, on reheating, these more volatile products are driven off. When the second distillation is forced, a solid black resinous residue is obtained, which constitutes common pitch. Wood tar has several constituents in common with coal tar; its most characteristic fluid ingredients being hydrocarbons with methylic acetate, acetone, eupione, and creosote, with solid resinous matters, paraffin, anthracene, chrysene, etc. It possesses valuable antiseptic properties, chiefly owing to the creosote it contains, whence its principal value for most purposes is derived. In addition to its various uses in the arts of coating and preserving timber and iron in exposed situations, and for impregnating ships' ropes and cordage, it has various applications for external use in medicine owing to its antiseptic properties.

Tara, or **Taro,** the native name given to plants of the genus *Colocasia*, natural order *Araceæ*, especially *C. esculenta* and *C. macrorhiza*, cultivated in the Pacific Islands for their esculent root, which, though pungent and acrid raw, becomes palatable when cooked. A pleasant flour is also made of the roots or tubers, and the leaves are used as spinach. The name is also given to the allied *Caladium esculenta*, whose tuberous root and leaves are used in the same manner.

Tara, a parish in Meath co., Ireland, 21 miles N. W. of Dublin. It was a royal residence in the early days of Ireland and from the hill of Tara was brought the famous stone long used in the coronation of the Scotch kings at Scone. It is now in the chair of Edward the Confessor at Westminster. A sort of Parliament used to be held at Tara, in which all the nobles and principal scholars of Ireland met to institute new laws or to extend and renew old ones, and to examine and correct the national annals and history of the country.

Tara Fern (*Pteris aquilina*), a large species of bracken, the rhizome of which was one of the principal articles of food of the Maoris before the settlement of New Zealand by the British colonists. The roots, about an inch in circumference, were cut in pieces, dried, and stacked. For use the root was steeped in water, dried in the sun, and then roasted. Good flour was obtained from it by beating on a stone.

Tarai, a moist and jungly tract of Northern India, running along the foot of the first range of the Himalayas for several hundred miles, with a breadth of from 2 to 15, infested by wild beasts, and generally unhealthy. The name is given distinctively to a district in the Kumaun division of the Northwest Provinces, consisting of a strip of country of about 90 miles in length E. and W. along the foot of the Himalayas, and about 12 miles in breadth; area, 938 square miles; pop. 206,993.

Taranaki, a provincial district of New Zealand; on the W. coast of the North Island; area 3,308 square miles, two-thirds of which is forest, and possesses an amazingly fertile soil, but settlement has been retarded by the lack of a harbor and by hostilities with the Maoris. The coast is lined for many miles by a deposit of titaniferous iron sand, from 2 to 5 feet deep, from which steel of the finest quality has been made. The district derives its name from the remarkable extinct volcano called by the Maoris Taranaki. Pop. (1906) 43,399.

Tarannon Shale, Professor Ramsay's name for certain beds existing at Tarannon and elsewhere, from South into North Wales. They are 1,000 to 1,500 feet thick in some places, and contain numerous species of graptolites, corals and the genera *Favosites* and *Cyathophyllum*, a crinoid (*Actinocrinus pulcher*), and a brachiopod (*Lingula symondsii*). Lyell combined them with the Woolhope limestone and shale and the Denbighshire grits, placing the whole under the Wenlock formation (Upper Silurian). Etheridge makes them of Lower Wenlock age. Called by Sedgwick, Rhayader slates.

Tarantass, a large covered traveling carriage, without springs, but balanced on long poles which serve the purpose, and without seats. Much used in Russia.

Tarantella, or **Tarantelle,** in music, a rapid Neapolitan dance in triplets; so called because it was popularly thought to be a remedy against the supposed poisonous bite of the tarantula spider, which was said to set people dancing. Older specimens of the dance are not in triplets. See TARANTISM: TARANTULA.

Taranto (ancient Tarentum), a seaport of Southern Italy, in the province of Lecce; on a rocky islet between the Mare Grande

COIN OF TARENTUM.

or Gulf of Taranto and the Mare Picollo, an extensive natural harbor on the E. side of the town; 72 miles S. S. E. of Bari. The harbor is sheltered by two small islands, San Paolo and San Pietro, the Chœrades of antiquity, and is closed by Cape San Vito on the S. E. The town is joined to the mainland by a six-arched bridge on the E. side, and on the W. by an ancient Byzantine aqueduct. The principal buildings are a modernized cathedral dedicated to St. Cataldo, a dubious 6th-century Irishman said to have been the first bishop of Tarentum, and a castle erected by Charles V. The Mare Piccolo is still famous for its shellfish, and a considerable portion of the population (1891, 25,246) finds employment in oyster and mussel fisheries. The honey and fruit are still famous also, but the people are today as lazy as in Horace's time.

The ancient Tarentum, founded by a body of Spartan emigrants about 708 B. C., grew to be the sovereign city of Magna Græcia. Here flourished about 400 B. C. the philosopher and geometer Archytas, under whom it became the center of the Pythagorean sect. At the height of its greatness it insolently provoked a quarrel with Rome (281), was saved for a little by Pyrrhus, King of Epirus, but taken in 272, and retaken and punished severely in 207 for revolting to the side of Hannibal five years before. Later it belonged to Byzantine, Saracen, and Norman masters, sharing the fortunes of the kingdom of Naples.

Tarantism, or **Tarantismus,** an epidemic dancing mania, prevalent in Italy in the 16th and 17th centuries, originating in an exaggerated dread of the consequences arising from the bite of the TARANTULA (*q. v.*), as a remedy for which the dance of the same name was adopted. This mania was most prevalent in Apulia, but spread over the great part of the peninsula. Tarantism was closely allied to St. Vitus' dance, and other epidemic nervous disorders of the latter period of the Middle Ages, but differed from them in its origin, in the wasting away of the sufferers, in their rhythmic movements, their partiality for bright and luminous surfaces, their passion for music, and its employment as a means of cure. According to other authorities, the disease consisted in the sufferer being attacked with extreme somnolency, which could only be overcome by music and dancing. It has long been satisfactorily established that the bite of the tarantula is incapable of producing serious consequences; so that while it is possible that some minor physical symptoms may have resulted from the direct effect of the bite, the mental disturbances and muscular agitations were certainly due to the secondary effects of these physical results on the imagination.

Tarantula (-ran'tu-lä), the *Lycosa tarantula,* a large spider, with a body about an inch in length; its bite was formerly

TARANTULA.

supposed to produce TARANTISM (*q. v.*), and doubtless in some cases, produces disagreeable symptoms. It is a native of Italy, but varieties, or closely allied species, are found throughout the S. of Europe. The tarantulas of Texas and adjacent countries are large species of Mygale. Also, a dance, or the music to which it is performed. See TARANTELLA.

Tarapacá, till 1883 the extreme S. province of Peru, but annexed by Chile after the war; area, 18,125 square miles; pop. (1907) 110,193. The country contains vast fields of nitrate of soda, as well as silver mines, deposits of guano, and flocks of sheep, alpacas, etc. Capital, IQUIQUE (*q. v.*). See CHILE.

Tarare, a town of France, department of the Rhone, on the Tardine, among the Beaujolais Mountains; 21 miles N. W. of Lyon. It has two fine churches of the Madeleine and St. André, and manufactures fine muslins, tarlatans, plush, velvets, and other textures, to the value of 7,000,000 francs yearly.

Tarascon, a walled town of France, in the Provençal department of Bouches-du-Rhône; 14 miles S. W. of Avignon and 8 N. of Arles. King René's castle, dating from 1400, is picturesque and well preserved; and a Gothic church (1187–14th century) is dedicated to St. Martha, who here is said to have subdued a dragon. But Tarascon is chiefly famous through associations with the immortal Tartarin. It has manufactures of woolen and silk fabrics, "saucissons d'Arles," etc. Pop. (1901) 8,885.

Taraxacum, a genus of plants, order *Asteraceæ*. *T. officinale* is the common dandelion. The root of this plant is very extensively employed as a medicinal agent, and is believed to possess aperient, diuretic, and alterative properties. It contains a bitter crystalline principle, to which it seems to owe its medicinal power. The bright yellow flowers of this plant open in the morning between five and six o'clock, and close in the evening between eight and nine — hence, this was one of the plants selected by Linnæus to form his floral clock.

Taraxacin, the bitter principle of dandelion root, extracted from the milky juice by boiling with water and allowing the concentrated decoction to evaporate. It forms warty crystals of a sharp, bitter taste, soluble in ether, alcohol, and boiling water.

Tarbagatai (-tī′), a range of mountains, 10,000 feet high, in Russian Central Asia, on the frontier between Semipalatinsk on the N. and Chinese Zungaria.

Tarbell, Ida Minerva, an American writer; born in Erie co., Pa., Nov. 5, 1857; was graduated at Allegheny College; studied in Paris 1891–1894; was associate editor of "McClure's Magazine" (1894-1906); Works: "Life of Napoleon Bonaparte" (1895); "Life of Madame Roland" (1896); "Life of Abraham Lincoln" (1900); "History of the Standard Oil Co." (1904); etc.

Tarbes (tärb), a town in the S. of France, capital of department of Hautes-Pyrenées; on the left bank of the Adour; 30 miles E. S. E. of Pau. The cathedral is the principal building. There is a government cannon foundry in the place which is the seat of an active general trade. Pop. (1901) 26,055. Tarbes dates from the time of the Romans, and its bishopric was founded in the year 420. It was in the hands of the English in the 13th and 14th centuries.

Tarchonantheæ, in botany, a sub-family of *Asteroidæ*. Leaves alternate; heads of flowers all tubular, the marginal ones smaller and feminine, the central ones fewer, larger, and hermaphrodite or masculine.

Tarchonanthus, the African fleabane; the typical genus of *Tarchonantheæ*. Cape shrubs, of which two species with purple flowers are cultivated in England.

Tardieu, Jules Romain (tär-dyuh′), a French story-writer; born in Rouen, France in 1805. Among his stories and sketches are: "The Art of Being Miserable" (1856); "The Truce of God: Recollections of a Sunday in Summer" (1862); "Book for Children who Cannot Read" (1863). He died in 1868.

Tardigrada ("slow steppers"), the name applied by Cuvier to the family of edentate mammals, which includes the existing sloths and the extinct Megatherium.

Tare, the common name of different species of *Vicia*, a genus of leguminous plants, known also by the name of vetch. There are numerous species and varieties of tares or vetches, but that which is found best adapted for agricultural purposes is the common tare (*V. sativa*), of which there are two principal varieties, the summer and winter tare. They afford excellent food for horses and cattle, and hence are extensively cultivated throughout Europe. The tare mentioned in Scripture (Mat. xiii: 36) is supposed to be the DARNEL (*q. v.*). *V. sativa* is found in fields in United States.

Tare, an allowance or deduction made on the gross weight of goods sold in boxes, barrels, bags, etc., for the weight of the boxes, etc. Tare is said to be real when the true weight of the package is known and allowed for; average, when it is estimated from similar known cases; and customary, when a uniform rate is deducted.

Tarentum. See TARANTO.

Target, a shield or buckler of a small size, circular in form, cut out of ox-hide, mounted on light but strong wood, and strengthened by bosses, spikes, etc.; often covered externally with a considerable amount of ornamental work. Also, the mark set up to be fired at in archery, musketry, or artillery practice, or the like. Targets for archery purposes are made of leather or canvas, stuffed with straw and painted with concentric rings of various colors, the center being golden. Rifle targets are generally square or oblong metal plates, and are divided into three or more sections — the bull's-eye, inner (or center), and outer, counting from the center of the target to the outside. In some targets there is a fourth division commonly called MAGPIE (*q. v.*).

Target Practice. The use of stationary targets for practice in the United States

army has given place to that of appearing and disappearing targets, which stimulate activity and increase the skill of the gunners. American soldiers, and particularly those of the regular service, have the reputation of being the best shots in the world, the latter having had much experience in snap shooting by reason of their service on the plains.

For recruits who have not seen such service, the "surprise" targets prove excellent schooling in quick aim and rapid firing. Of these moving targets there are several varieties. In infantry firing at appearing targets, a section, or company, is marched forward to some marked point, when nearing it a target suddenly comes into view. It represents a body of cavalry crossing the plains ahead. The infantry forms in the direction as quickly as possible and opens fire. The target remains in sight only 15 or 20 seconds, after which it is replaced by other targets appearing and disappearing in turn and representing the successive positions of the cavalry. One form of target alternately folds and opens up. It simulates an enemy advancing and kneeling to fire. Another moving target is a light frame mounted on a bamboo roller basket having a long trail piece to steady it. This is hauled swiftly across an open space and can move quickly over plowed ground and rough stubble.

The appearing and disappearing targets are worked from a pit position. Light lines leading along the ground and reeving through pulleys enable the operator in his safety cellar to flash a target into view at any desired time. For artillery firing there are frames mounted parallel to the line of fire, and which can be thrown into view by merely turning them so that they will show at right angles to the line of fire. To catch aim quickly, and fire rapidly and with accuracy is the object striven for in this system of target practice.

The proficiency of American gunners in the naval engagements of 1898 attracted much attention. It has been attributed, very correctly, to the pains taken in target practice. Once a month, every ship in the United States navy, no matter whether she is in a home or a foreign port, is compelled to go to sea for target practice. A float containing a canvas target is turned adrift on the sea while the vessel maneuvers around it for position exactly as if she were entering an engagement. Sometimes the target is triangular in shape, but it is oftener square or rectangular. Most of the floating navy targets average about 15 feet in height, mounted on a catamaran. The ranges for target practice vary with the size of gun used from 1,000 to 5,000 yards; at the latter range the coast defense monitor "Monterey," firing at a hulk, placed three successive shots from her 10 and 12-inch guns inside of a space 30 by 40 feet. At that range, within a very small fraction of three miles, the sides of the hulk could barely be distinguished. Still more remarkable is the record made by the flagship "Olympia" before the Manila campaign. At a range of 4,500 yards upward of two dozen shots were placed in a target 15 feet high by 40 feet in length, and that, too, with guns of only five-inch caliber. In a small triangular target only five feet high, the cruiser "Philadelphia," using 100-pound shells from the six-inch navy rifle, placed five shots in succession through the canvas at a range of 2,000 yards. The auxiliary cruiser "Gloucester," firing at a six-foot triangular target with her small rapid-fire guns, literally peppered the canvas at a range of 2,000 yards. During the regular gun practice every rifle on the ship is brought into action, from the small three-pounder to the guns of 10, 12, or 13 inches.

Targowitz, a small town in the province of Kieve, Russia; noted for the Targowitz Confederation or plot formed here (May 14, 1702) by five Polish nobles, who were instigated by Catherine II. Its object was the overthrow of the new constitution, and it led to the second partition of POLAND (*q. v.*).

Targum, the general term for the Aramaic versions — often paraphrases — of the Old Testament, which became necessary when, after and perhaps during the Babylonian Exile, Hebrew began to die out as the popular language, and was supplanted by Aramais.

The origin of the Targum itself is shrouded in mystery. The first signs of it — as an already fixed institution — have been found by some in Neh. viii: 8, and according to tradition Ezra and his coadjutors were its original founders. However this be, there can be no doubt that its beginnings belong to a comparatively early period. The "Mishna" contains a number of strict injunctions respecting it, and also respecting a certain guild of Meturgemans (whence "dragoman") or interpreters, who had sprung up as professional followers of those learned men who, at a previous period, had volunteered their services in the translation and paraphrastic interpretation, both activities being implied by the term. At first, and indeed for many centuries, the Targum was not committed to writing, for the same reason that the "Oral Law" or Halakhah itself was not at first intended ever to become fixed as a code for all times. In the course of time, however, both had to yield to circumstances, and their being written down was considered preferable to their being utterly forgotten, of which there was no small danger. Yet a small portion

only of the immense mass of oral Targums that must have been produced has survived.

All that is now extant are three distinct Targums on the Pentateuch, a Targum on the Prophets, Targums on the Hagiographa — viz., on Psalms, Job, Proverbs, the five "Megilloth" (Song of Songs, Ruth, Lamentations, Esther, Ecclesiastes), another Targum on Esther, one on Chronicles, one on Daniel, and one on the apocryphal pieces of Esther. The most important of the three Pentateuch Targums is the one named after Onkelos, probably a corruption of Akylas (Aquila, a proselyte, one of Gamaliel's pupils), whose Greek version had become so popular that this Aramaic version was honored with being called after it. This Targum seems to have been originally produced among the scholars of R. Akiba between A. D. 150 and 200 in Palestine, and sent to Babylonia, where it was more needed; wherefore it is called Babli. Here it was probably edited about 300, and afterward voweled in the Babylonian method. Subsequently voweled in the Palestinian method, it spread from Palestine over the world. It is an excellent translation for the people, and adheres more closely to the Masoretic text than any other ancient translation. It is useful for the exegete, the linguist, and the antiquary.

Two other Targums on the Pentateuch have hitherto been known as Targum Jonathan ben Uzziel and Targum Jerushalmi. They are of Palestinian or Syrian growth. Jerushalmi is fragmentary, and appears to be a Haggadic supplement to Onkelos. The Pseudo-Jonathan, by its maturer angelology, its abbreviations, and other signs, appears to be a later recension of the Jerushalmi. It cannot well have been composed before 750. As a version this Targum is of small importance; but it is valuable as a storehouse of allegories, parables, sagas, and the like popular poetry of its time. Its language and grammar are exceedingly corrupt; it abounds, moreover, with foreign — Greek, Latin, Persian, and Arabic — terms. It mentions Constantinople (Num. xxiv: 19, 24); and names Khadija and Fatima (Gen. xxi: 2). Its general use lies more in the direction of Jewish literature itself, as well as of archæology and antiquities of the early Christian centuries, than in that of a mere direct interpretation of the Bible text.

The Targum on the Prophets is generally and erroneously ascribed to Jonathan ben Uzziel, an eminent scholar of Hillel the Elder; the fact being that, except one spurious Talmudical passage, in which mention is made of his having translated the Prophets, this Targum is everywhere else, from the Talmud down to the authorities of the 10th century, ascribed to one R. Joseph, president of the Babylonian academy of Sora about 322. This Targum, while tolerably literal in the first — the historical — books, gradually becomes a frame for Haggada, which it introduces at every turn and at great lengths. It is considerably interpolated, containing historical bits disguised, or rather typified, lyrical pieces of some poetic value, and much Messianic lore. In language and general manner it resembles Onkelos, which evidently lay before the author.

Joseph the Blind, to whom the foregoing Targum is ascribed, is the reputed author of Targums on the Hagiographa. Several centuries lie between him and them, their date being approximately between 800 and 1000. Certain distinctions between the different books must further be made. The Targums on Psalms, Job, and Proverbs were probably contemporaneous compositions due to private enterprise in Syria. The two former are made more paraphrastic than the last, which resembles closely the Syriac version. The paraphrase on the five "Megilloth" mentions the Mohammedans, and is of later date, probably one man's work. It is principally a collection of more or less poetical fancies, traditions, and legends to which the single verse in hand merely seems to furnish the keynote. Its dialect lies somewhat between the East and West Aramaic. The Targum on the Book of Chronicles — almost unknown till it was printed in the 17th century — also belongs to a late period, and was probably composed in Palestine. There are some useful philological, historical, and chiefly geographical hints to be gleaned from it, but nothing more; least of all can it be used exegetically. A Persian version of a Targum on Daniel (unedited) is all that has been discovered on that book as yet. It was probably composed in the 12th century, the influence of the early Crusades being plainly visible in it. On the paraphrase of the apocryphal pieces of Esther we shall not dwell here, any more than on the scanty fragments of a "Palestinian Targum" that are found either interspersed in the general (Babylonian) Targum, or as independent pieces. It seems probable that more of this Palestinian version will come to light some day, as authorities of a few centuries back still quote from it rather largely. At present, however, their quotations are nearly all that is known. By 900 in Africa and Spain the Targum had begun to be disused in public, Arabic, or the national language being substituted. In Yemen the Aramaic Targum is still used in the ancient manner, the meturgeman standing beside the reader and rendering verse by verse.

Tarifa (-rē'fä), the most S. town of Europe; a seaport of Spain, in the province of Cadiz in Andalusia; 21 miles S. W. of Gibraltar. The town is still quite Moorish in

aspect, and retains its alcazar and battlemented Arab walls. A causeway connects it with a small island, on which are some powerful fortifications and a lighthouse, 135 feet above the sea-level. Tunny and anchovy fishing is and has been since Roman times the principal occupation of the inhabitants, but the preparation of leather is also carried on, and there is a trade in sweet oranges. Tarifa, called Julia Joza by Strabo, was occupied in A. D. 710 by the pioneers of the Moorish invasion, under Tarif Abû-Zor'a, whence it obtained its Arabic name of Jezîret-Tarîf (Tarîf's island). It was taken from the Moslems, after an obstinate siege, in 1292, by Sancho IV. of Castile, and its first Spanish governor was Alonzo Perez de Guzman, celebrated in the Romanceero for his valiant defense of the town against the besieging Moors in 1294. During the Peninsular war Tarifa was successfully defended by Gough with 1,800 British troops and 700 Spaniards against a besieging army of 10,000 French (December, 1811 to January, 1812.) Pop. 13,206.

Tariff, a list or table of goods with the duties or customs to which they are liable, either on exportation or importation; a list or table of duties or customs to be paid on goods imported or exported, whether such duties are imposed by the government of a country or are agreed on between the governments of two countries having commerce with each other. The scale of duties depends on the supply and demand of goods, the interests and wants of the community, etc., and is therefore constantly changing.

The tariff legislation of the United States has been constantly fluctuating, and has grown yearly in importance as a question of foreign policy. The most noted tariff bill ever passed by Congress was that taking its name from the then chairman of the Committee on Ways and Means, the late President McKinley. This tariff imposed high duties on imports, some specific and others ad valorem. It was repealed in 1894 by the passage of the Wilson bill, which became a law by the refusal of President Cleveland to sign or veto it. On the tariff question the nation has generally been pretty evenly divided, or with but a slight preponderance in favor of a high protective duty. Of former tariff measures that proposed in 1833 by Henry Clay, of Kentucky, and known as the compromise tariff, occupies the most prominent place in American history. Though Great Britain is now regarded as a free-trade country, yet on her tariff are listed 19 articles of import, from which she derives an average of about 20 per cent. of her total revenue. The British tariff is based not on an ad valorem tax, but depends entirely on a specific import, in some cases modified by a range of price between the highest and lowest figures, which it sets for an article. Thus for spirits worth a certain amount per gallon, the tax is so much per barrel, while for spirits of the next higher grade (according to price per gallon) a higher duty per barrel is collected.

Tarik, Hill of. See HILL OF TARIK.

Tarkio College, a coeducational institution in Tarkio, Mo.; founded in 1883; under the auspices of the United Presbyterian Church; has productive funds exceeding $160,000; grounds and buildings valued at over $80,000; scientific apparatus, etc., $5,500; volumes in the library, about 3,000; ordinary income, $35,000; average number of faculty, 26; average student attendance, 315; graduates since opening, over 300.

Tarlatan, a thin and fine fabric of cotton, mostly used for ladies' ball dresses. It is cheap, but does not stand washing.

Tarleton, Sir Banastre, an English military officer; born in Liverpool, England, Aug. 21, 1754. He took an active part in command of British troops during the Revolutionary War and was notorious for his cruelty as a partisan leader in the Carolinas in 1780–1781. He organized the "British Legion," composed of regulars and Tories; was defeated by Morgan at Cowpens in January, 1781, and surrendered with Cornwallis at Yorktown. He afterward became a member of Parliament and lieutenant-general. In 1787 he published a "History of the Campaigns of 1780–1781." He died Jan. 23, 1833.

Tarn, a river of Southern France, which rises on the S. slope of Mount Lozère, near Florac, in the department of Lozère; flows through the departments of Aveyron, Tarn, Haute-Garonne, and Tarn-et-Garonne; and finally joins the Garonne. Its whole course is 230 miles, of which about 100 miles beginning at Alby are navigable.

Tarn, a department of Southern France, named from the above river; area, 2,217 square miles; pop. (1906) 330,533. The surface is intersected by hills, which generally terminate in flat summits, on which, as well as their sides, cereals and vines are cultivated. The minerals include iron and coal, both of which are partially worked. Woolens, linens, hosiery, etc., are manufactured; capital, Alby.

Tarn-et-Garonne, a department of France, named after its two chief rivers; area, 1,436 square miles; pop. (1906) 188,553. This department belongs to the basin of the Garonne which traverses it S. to N. W., and receives within it the accumulated waters of the Tarn and Aveyron which are both navigable. The arable land raises heavy crops of wheat, maize, hemp, tobacco, grapes, and fruit of all kinds. The most important manufactures consist of

common woolen cloth and serge, linen goods, silk hosiery, cutlery, leather, etc.; capital, Montauban.

Tarnopol, a town of Galicia, Austria-Hungary; on the Sered river; 80 miles S. E. of Lemberg. It has a Roman Catholic and a Greek Church, a Jesuit college, upper gymnasium, etc. There is considerable trade in corn and other agricultural products. A great horse market with horse races is held annually. Pop. (1900) 32,082.

Tarnow, a town of Galicia, Austria-Hungary; 47¾ miles E. of Cracow; on the navigable Dunjec river, not far from the mouth of the Vistula. It is the seat of a bishop, and has a town house and cathedral with curious statues of the princes of Ostrog and Tarnow. The chief trade is in corn, linen, leather, and timber. Pop. (1900) 31,548.

Tarnovski (tär-nov'skē), **Stanislav, Count,** a Polish historian of literature; born in Dzikov, Galicia, Nov. 7, 1837. Among his numerous monographs on the history of literature are: "History of the Pre-Christian World"; "The Polish Novel in the Beginning of the 19th Century"; "Decline of Polish Literature in the 18th Century"; "Shakespeare in Poland"; "Studies in the History of Polish Literature" (1886–1892),—his greatest work, and a Polish classic.

Taro (*Colocasia macrorhiza,* or *Arum esculentum*), a plant of the natural order *Araceæ,* of the same genus with the Cocco (*q. v.*) or Eddoes, and cultivated for its roots, which are a principal article of food in the South Sea Islands. They are washed to take away their acridity, and cooked in the same way as bread fruit; they may also be boiled or made into pudding. A pleasant flour is made of taro. The plant has no stalk; broad, heart-shaped leaves spring from the root; and the flower is produced in a spathe. The leaves are used as spinach.

Tarpan, the wild horse of Tartary, belonging to one of those races which are by some authorities regarded as original. They are not larger than an ordinary mule. The color is invariably tan or mouse, with black mane and tail. During the cold season their hair is long and soft, but in summer it falls much away. They are sometimes captured by the Tartars, but are reduced with great difficulty to subjection.

Tarpaulin, a cloth of stout canvas, coated with tar or other waterproof compound. Employed on shipboard and ashore for covering hatches, boats, hammocks, etc., and protecting articles generally from the weather. A tarpaulin, or thick unpainted canvas, sometimes called a paulin, forms part of the equipment for each carriage of a field-battery of artillery. Also a sailor's hat, covered with painted or tarred cloth; a painted or tarred canvas cover generally.

Tarpeia (-pē'yä), one of the vestal virgins of Rome, the daughter of Spurius Tarpeius, governor of the citadel on the Capitoline Hill. She agreed to open the gates to the Sabines if they would give her "what they wore on their arms" (meaning their bracelets). The Sabines, "keeping their promise to the ear," crushed her to death with their shields, and she was buried in that part of the hill called the TARPEIAN ROCK (*q. v.*).

Tarpeian Rock, a rock on the Capitoline Hill at Rome, named from the maid Tarpeia. Traitors were cast down this rock and so killed.

Tarquinius, Lucius, surnamed PRISCUS (the first or the elder), in Roman tradition the 5th King of Rome. The family of Tarquinius was said to have been of Greek extraction, his father, Demaratus, being a Corinthian who settled in Tarquinii, one of the chief cities of Etruria. Having removed with a large following to Rome, Tarquinius became the favorite and confidant of the Roman king, Ancus Martius, and at his death was unanimously elected his successor. According to Livy he made war with success on the Latins and Sabines, from whom he took numerous towns. Tarquinius also distinguished his reign by the erection of the Cloaca Maxima, the Forum, the wall round the city, and, as is supposed, he commenced the Capitoline Temple. After a reign of about 36 years he was killed by assassins employed by the sons of Ancus Martius in 578 B. C.

Tarquinius, Lucius, surnamed SUPERBUS ("the proud"), the last of the legendary kings of Rome, was the son of Lucius Tarquinius Priscus. Tarquin, on reaching man's estate, murdered his father-in-law, King Servius Tullius (the date usually given for this event is 534 B. C.), and assumed the regal dignity. He abolished the privileges conferred on the plebeians; banished or put to death the senators whom he suspected, never filled up the vacancies in the senate, and rarely consulted that body. He continued the great works of his father, and advanced the power of Rome abroad both by wars and alliances. By the marriage of his daughter with Octavius Mamilius of Tusculum, the most powerful of the Latin chiefs, and other political measures, he caused himself to be recognized as the head of the Latin confederacy. After a reign of nearly 25 years a conspiracy broke out by which he and his family were exiled from Rome (510 B. C,), an infamous action of his son Sextus being part of the cause of the outbreak (see LUCRETIA). He tried repeatedly, without suc-

cess, to regain his power, and at length died in Cumæ in 495 B. C.

Tarr, Ralph Stockman, an American scientist; born in Gloucester, Mass., Jan. 15, 1864; was graduated at the Lawrence Scientific School, Harvard University, in 1891. He was an assistant on the United States Fish Commission and in the Smithsonian Institution in 1882–1883, and assistant in the United States Geological Survey in 1888–1891; assistant Professor of Geology at Cornell University in 1892–1897; and in the latter year became Professor of Dynamic Geology and Physical Geography there. His publications include: "Economic Geology of the United States" (1893); "Elementary Physical Geography" (1895); "Elementary Geology" (1897); "First Book of Physical Geography" (1897); and the "Tarr and McMurry Geographies."

Tarragon, in botany, the *Artemisia dracunculus.* The stems are two to three feet high, smooth, and bright green. The leaves undivided, narrow, and somewhat succulent. The heads small, round, and smooth, with seven or eight florets. It is a native of Siberia, where the leaves, which emit a stimulating odor and if chewed produce a pungent moisture in the mouth, are used with many dishes in cookery and as a flavoring for vinegar.

Tarragona, a seaport of Spain; capital of a province of the same name; on the Francoli, at its mouth in the Mediterranean on a limestone rock. The chief building is the large cathedral, a fine Gothic building partly of the 11th century. The town was founded by the Phœnicians, and became of great importance under the Romans. In its environs are an ancient amphitheater, a circus, an aqueduct, etc. It was taken and sacked by the French under Suchet in 1811. It has a trade in corn, oil, wine, fruit, etc. Pop. 27,225.

Tar River, a river in North Carolina, which rises in Granville county, flows S. E., and enters Pamlico Sound by a wide estuary. The lower part of it is called Pamlico river. It is about 200 miles long.

Tarrytown, a village in Westchester co., N. Y.; on the Hudson river, and on the New York and Hudson river railroad; 27 miles N. of New York. Its precincts include Sleepy Hollow. The Hudson here has an expansion called Tappan Zee, and the village is built on rising ground, commanding an extensive view. It contains a Revolutionary Soldiers' Monument and other objects of interest, Irving Institute, a number of libraries, a National bank, and weekly newspapers. It has manufactories of plumbers' tools, tile, and shoes, and an assessed property valuation exceeding $12,000,000. It is celebrated as the place where Major André was captured, and also as the place where the remains of Washington Irving were interred. Pop. (1890) 3,562; (1900) 4,770; (1910) 5,600.

Tarshish, a place frequently mentioned in the Old Testament. It is now generally identified by Biblical critics with the Tartessus of the Greek and Roman writers, a district of Southern Spain, near the mouth of the Guadalquivir, settled by the Phœnicians.

Tarsia, or **Tarsiatura,** a species of inlaying in wood, much practised in Italy during the Middle Ages, especially for wall paneling. Wood in its natural colors was employed in the earlier specimens, but afterward, when more complicated figures, birds, flowers, etc., were introduced, the various pieces were stained. Shades are produced by immersing the pieces in hot sand; the design is built up on paper and applied in the manner of veneer.

Tarsia Work, a kind of mosaic woodwork or marquetry much in favor in Italy in the 15th century. It was executed by inlaying pieces of wood of different colors and shades into panels of walnut wood, so as to represent landscapes, figures, fruits, flowers, etc. At Sorrento and other places the manufacture of wood mosaic, in modern times, has become celebrated.

Tarsipes (tar'si-pēz), in zoölogy, the sole genus of the sub-family *Tarsepidinæ,* with a single species, *T. rostratus,* the noolbenger or tait, from Western Australia. Head with elongated and slender muzzle; mouth opening small; fore feet with five well-developed toes, hind feet rather long and slender; ears moderate, rounded; tail prehensile, longer than head and body. This little marsupial lives in trees and bushes, and uses its tail in climbing; it feeds on honey, which it procures by inserting its long tongue into the blossoms of flowers; but one which Mr. Gould kept in confinement ate flies readily.

Tarsius, the sole genus of the family *Tarsiidæ,* with a single species. *T. spectrum,* the tarsier, malmag, or specter tarsier, a very singular little animal somewhat smaller than an American squirrel, with very large eyes and ears, and a long thin tail with a tuft at the end; general color fawn-brown, bare parts of a flesh tint, forehead, face, and nose reddish, with a black streak over the eye. It is found in the forests of many of the islands of the Indo-Malayan Archipelago, feeding on insects and lizards. It sleeps during the day, but is very active by night, moving from place to place by jumps, a method of progression for which its curious hind legs, not unlike those of a frog, are well adapted. Its strange appearance causes it to be regarded with superstitious awe by the na-

tives of the East Indian Archipelago. The tarsier is rare, not more than two being generally found together, and only produces one at a birth.

THE SPECTACLED TARSIER.

Tarsus, in anatomy, that part of the foot which in man is popularly known as the ankle, the front of which is called the instep. It corresponds with the wrist of the upper limb or arm and is composed of seven bones (see FOOT). In insects the tarsus is the last segment of the leg. It is divided into several joints, the last being generally terminated by a claw which is sometimes single and sometimes double. In birds the tarsus is that part of the leg (or properly the foot) which extends from the toes to the first joint above; the shank.

Tarsus, the ancient capital of Cilicia, and one of the most important cities in Asia Minor; on the Cydnus river; 12 miles from the sea in the midst of a productive plain. It was a great emporium for the traffic carried on between Syria, Egypt, and the central region of Asia Minor. In the time of the Romans two great roads led from Tarsus, one N. across the Taurus by the "Cilician Gates," and the other E. to Antioch by the "Amanian" and "Syrian Gates." Tarsus, which was sacred to Baal Tars, and is thought by some to have been founded by Sennacherib, 690 B. C., was probably of Assyrian origin, but the first historical mention of it occurs in the "Anabasis" of Xenophon, where it figures as a wealthy and populous city, ruled by a prince tributary to Persia. In the time of Alexander the Great it was governed by a Persian satrap; it next passed under the dominion of the Seleucidæ, and finally became the capital of the Roman province of Cilicia (66 B. C.). At Tarsus Antony received Cleopatra, when as Aphrodite she sailed up the Cydnus, with magnificent luxury. Under the early Roman emperors Tarsus was as renowned for its culture as for its commerce, Strabo placing it, in respect to its zeal for learning, above even Athens and Alexandria. The natives were vain and luxurious; a Moslem general estimated their number at 100,000. Weaving goats' hair was the staple manufacture. It was the birthplace of the apostle PAUL (*q. v.*), who received the greater part of his education here; the Stoic Antipater and the philosopher Athenodorus were also natives, and here the Emperor Julian was buried. Gradually, during the confusions that accompanied the decline of the Roman and Byzantine power, it came into the hands of the Turks, and fell into comparative decay; but even yet this modern, squalid, and ruinous city, under the name of Tarso or Tersus, has a permanent population of 7,000, and a pop. of 30,000 in winter, and exports corn, cotton, wool, gall nuts, wax, goats' hair, skins, hides, etc.

Tartan, woolen cloth, cross-barred with stripes of various colors, forming panes, and constituting the peculiar patterns which are said to have formerly distinguished the different Scotch Highland clans, each clan having its own peculiar pattern. North ("Record of Dress, Arms, and Sciences of the Highlanders," ii: 16–19), gives a list of the tartans, but other authorities think that the patterns are of comparatively recent invention. The term is also applied to the checkered patterns themselves in which the cloth is woven, and which are frequently printed or painted on various surfaces, as paper, wood, etc.

Tartar, the substance called also argal, or argol, deposited from wines incompletely fermented, and adhering to the sides of the casks in the form of a hard crust. What is called tartar emetic is a double tartrate of potassium and antimony, an important compound used in medicine as an emetic, purgative, diaphoretic, sedative, febrifuge, and counter-irritant. Tartar of the teeth is an earthy-like substance which occasionally concretes on the teeth and is deposited from the saliva. It consists of salivary mucus, animal matter, and phosphate of lime.

Tartaric Acid, $C_4H_6O_6$, the most important of vegetable acids, occurs in many fruits, especially the grape. During fermentation the juice of the grape deposits the substance known in commerce as tartar or ergol. This substance, essentially the bitartrate of potash, is hardly soluble in cold water, but may be crystallized by cooling from its solution in boiling water. Thus purified it is known as cream of tartar, having the composition $KHC_4H_4O_6$. This salt is acid to test paper, and from it the neutral salt ($K_2C_4H_4O_6$) may be obtained by evaporation of the solution of the bitartrate previously neutralized with potash. The crystallized tartaric acid resembles this salt in composition, having hy-

drogen instead of potassium. To prepare it, the impure bitartrate is boiled in water, and carbonate of lime added as long as effervescence continues, indicating the escape of carbonic acid. The action results in the formation of the insoluble tartrate of lime, and the soluble tartrate of potash, and then by the addition of chloride of calcium the potassium is replaced altogether by the lime, chloride of potassium appearing in solution. The lime salt is then strained and boiled with dilute sulphuric acid, when sulphate of lime remains undissolved, and from the filtered solution tartaric acid may be obtained in transparent prismatic crystals by evaporation. The acid is soluble in about three-fourths of its weight in hot water. When kept, this solution is found to deposit a fungoid growth, acetic acid at the same time appearing in the solution. Crystals of tartaric acid fuse at 182° C. without loss of weight, but the fused mass is found to consist of a mixture of two new acids which are uncrystallizable. The one metatartaric acid has apparently the same formula as tartaric acid, and its salts the metartartrates are more soluble in water than the tartrates, and may be converted into the latter by boiling. The other acid, isotartaric acid, has the constitution $HC_4H_5O_6$; and its salts, also much more soluble than the tartrates, may be similarly converted by boiling. At 190° C., tartaric acid loses water, and is converted into a white insoluble substance known as tartaric anhydride ($C_8H_8O_{10}$). The most important of the salts of tartaric acid is the double tartrate of antimony and potash, commonly called tartar emetic. It is prepared by digesting cream of tartar with teroxide of antimony, which has been prepared by boiling antimony with sulphuric acid. From the boiled filtered solution octahedral crystals are deposited, having the composition $(2KSbOC_4H_4O_6)\,Aq$. The water of crystallization is expelled at 100° C. At 260° C. an additional molecule of water is lost, but the new salt ($KSbC_4H_2O_6$) may be reconverted into tartar emetic by dissolving it in water. Compounds analogous to tartar emetic have been obtained in which antimony is replaced by borax or arsenic, and potassium by silver lead or sodium. Rochelle salt is a double tartrate of potash and soda, prepared by neutralizing cream of tartar with carbonate of soda. By deoxidation tartaric acid may be converted into malic and succinic acids, which have the compositions $H_2C_4H_4O_5$, and $H_2C_4H_4O_4$ respectively; and these by suitable means may be reconverted in tartaric acid.

Tartar Emetic, in chemistry and pharmacy, tartarated antimony. $KO\cdot SbO_3\cdot C_8H_4O_{10} + 2HO$, or $KSbC_4H_4O_7H_2O$. Internally in small doses it is diaphoretic, expectorant, and probably cholagogue; in larger doses it is an emetic or a purgative. When a patient becomes accustomed to it, it is then sedative. Externally it is a powerful irritant, producing pustules like those of smallpox. As an ointment or a hot aqueous solution, it is a powerful counter-irritant.

Tartaric Anhydrides. Tartaric acid is capable of forming several anhydrides, three of which are known. (1) Ditartaric acid $= \frac{C_4H_4O_5}{C_4H_6O_6}$ (tartralic acid); formed by heating tartaric acid for some time at a temperature of 170°; is very soluble in water and not crystallizable. Its salts are resolved by boiling into ordinary tartrates. (2) Tartrelic acid $= C_4H_4O_5$; soluble tartaric anhydride; obtained by quickly heating small quantities of tartaric acid until it swells up. It is a yellowish, deliquescent mass which dissolves in water, forming an acid solution. (3) Insoluble tartaric anhydride. $C_4H_4O_5$; obtained by heating tartaric acid for some time to 150°, exhausting the product with cold water, and drying it in a vacuum. It is a white powder, insoluble in water, alcohol, and ether, and converted by boiling into tartaric acid.

Tartars, or **Tatars,** originally certain Tungusic tribes in Chinese Tartary, but extended to the Mongol, Turkish, and other warriors, who under Genghis Khan and other chiefs were the terror of the European Middle Ages. The name, originally Turkish and Persian *Tatar,* was doubtless changed to Tartar, either consciously or unconsciously, because they were supposed to be like fiends from hell (Greek *tartaros,* "hell"). The term is used loosely for tribes of mixed origin in Tartary, Siberia, and the Russian steppes, including Kazan Tartars, Crim Tartars, Kipchaks, Kalmucks, etc., and has no definite ethnological meaning. In the classification of languages Tartaric is used of the Turkish group. See MONGOLS: TURANIAN.

Tartarus, according to Hesiod, the son of Æther and Gæa, and father of the giants Typhœus and Echidna. In the Iliad, Tartarus is a place as far beneath Hades as heaven is above the earth — a dark desolate region into which Jews hurled the rebel Titas. Afterward the name was sometimes used as a synonym of Hades, but more frequently to denote a place of punishment.

Tartary, properly TATARY, the name under which, in the Middle Ages, was comprised the whole central belt of Central Asia and Eastern Europe, from the Sea of Japan to the Dnieper, including Manchuria, Mongolia, Chinese Turkestan, Independent Turkestan, the Kalmuck and Kirghiz steppes, and the old khanates of

Kazan, Astrakhan, and the Crimea, and even the Cossaek eountries; and henee arose a distinetion of Tartary into European and Asiatie. But latterly the name Tartary had a mueh more limited signifieation, ineluding only Chinese Turkestan and Western Turkestan. It took its name from the Tatars or TARTARS (*q. v.*).

Tartessus. See TARSHISH.

Tartini, Giuseppe, an Italian musieian; born in Pirano, Istria, April 12, 1692. He beeame so exeellent a performer on the violin that he was appointed master of the band in the Church of St. Anthony, at Padua. His works are sonatas, and a treatise on musie, whieh was translated into English by Stillingfleet. He died in Padua, Italy, Feb. 16, 1770.

Tartramic Acid, $(CHHO)_2\begin{matrix}CONH_2\\COOH.\end{matrix}$; obtained as an ammonium salt by the action of ammonia on tartarie anhydride. The free aeid separated from its caleium salt by sulphurie aeid is syrupy.

Tartramic Ether, $(CHHO)_2\begin{matrix}CO(NH_2)\\CO(C_2H_5)O.\end{matrix}$; tartramethane obtained by the aetion of aleoholic ammonia on tartarie ether. Ammonia eonverts it into tartramide.

Tartramide, $C_2H_2(OH)_2(CO\cdot NH_2)_2$; obtained by gently heating diethylie tartrate with aleoholie ammonia. It forms rhombic erystals, soluble in water and aleohol.

Tartranil, $C_2H_2O\begin{cases}CO(NH_2)\\CO(C_6H_5)O,\end{cases}$ phenyltartrimide; obtained by the dehydration of tartrate of aniline. It may be purified by reerystallization. It is tasteless, forms naereous laminæ whieh dissolve in water and aleohol, but sparingly in ether, melt about 200°, and deeompose at 230°.

Tartrate, or **Tartarate,** a salt of tartrie aeid. In pharmacy, tartrate of iron and potash = tartarated iron. Tartrate of potash is given as a diuretie and alternative, or in larger doses as a purgative; and tartrate of soda and potash is Roehelle salt.

Tartrimide, $C_2H_2O\begin{cases}COH_2N\\COHO,\end{cases}$ a hypothetical substanee of whieh the phenyl compound is known (tartranil).

Tartronic Acid, $CH(OH)(CO\cdot OH)_2$ hydroxy-malonie aeid; obtained by evaporating an aqueous solution of dinitro-tartarie aeid, or by the aetion of naseent hydrogen on masoxalie aeid. It erystallizes in large eolorless prisms, soluble in water and aleohol, and melts at 180° with evolution of water and earbonie anhydride.

Tartuffé, the name of the ehief eharacter in what is generally reeognized as the finest of Molière's comedies, has come to be synonymous with "hypoerite" throughout the world, just as "Peeksniff" is in English-speaking eountries. The eharaeter of Tartuffe was probably suggested by a eertain Abbé Roquette, a parasite of the Prinee of Conti, and the great situation of the piece (aet iii: seene 6) was borrowed from a novel of Searren's, who again borrowed the idea from a Spanish work. The origin of the name Tartuffé is eonneeted by a rather apoeryphal aneedote with the Italian word *tartufi,* meaning "truffles." The priests considered themselves deeply aggrieved by the eharaeter of Tartuffé, and though the eomedy was written in 1664, it was not till 1669 that Molière obtained permission to perform it publicly and in full. When it was at last produeed it ran for three months. An English adaptation of it by Biekerstaff still holds the stage under the title of "The Hypoerite," "Dr. Cantwell" being the name given to the English Tartuffé.

Taschereau, Elziar Alexandre, a Canadian elergyman; born in Sainte-Marie-de-la-Beauee, Franee, Feb. 17, 1820; studied in Quebee and Rome; and was ordained to the Roman Catholie priesthood in 1842. In the same year he was made Professor of Moral Philosophy in the Seminary of Quebee; held that ehair till 1854, when he was sent to Rome to request the Pope to ratify the deerees of the Provineial Counеil. Returning to Quebee in 1856, he beeame direetor of the minor seminary and in the following year direetor of the major seminary. He was made superior of the latter and reetor of Laval University in 1860; beeame vieargeneral of the dioeese in 1862; and was eonseerated Arehbishop of Quebee on Mareh 19, 1871. The eardinal's hat was eonferred upon him July 21, 1886, he being the first Canadian to reeeive sueh a preferment. He died in Quebee, Canada, April 12, 1898.

Tashkend, or **Tashkent,** the eapital of Russian Turkestan; 300 miles N. E. of Samareand; on a small river whieh empties itself into the Syr-Daria or Jaxartes. It eonsists of an aneient walled eity and a new European quarter with broad streets bordered by eanals and avenues of trees. The Russian eitadel lies a little to the S. There are extensive military stores, offieial buildings, Russian sehools of all grades, an observatory and geographieal soeiety, Russian and Kirghiz newspapers, and a brisk trade with Russia and other parts of Central Asia. It is eonneeted with the European system of telegraphs, and has manufaetures of silk, leather, felt goods, and eoarse poreelain. Onee eapital of a separate khanate, Tashkend was in 1810 eonquered by Khokand, and sinee 1868 has been Russian. Pop. (1908) 155,673. See TURKESTAN.

Tasimeter, an instrument, invented by Edison, for measuring very minute varia-

tions of pressure, temperature, moisture, etc. It is founded on the discovery of the inventor that carbon, when pressed in the form of a button, affects the electric currents passing through the same, and offers a resistance which diminishes with the pressure. So sensitive is the carbon that, when this pressure varies to the amount of one-millionth part of an inch, the variation in the electric current passing through it will cause a proportional deflection of the galvanometer needle. The tasimeter is an outgrowth of Edison's experiments with that form of telephone with which he tried to vary the intensity of electric waves by means of the human voice; and its superiority to the thermopile may be thus exemplified: A hot iron placed a few inches from a thermopile will deflect the needle of an ordinary galvanometer about 1°; the human finger, held four inches from a tasimeter, will deflect the needle of a similar galvanometer 6°. The practical uses of the instrument are said to be: (1) Warning to vessels of the approach of icebergs, by exposure to the air or to the water cooled by their vicinity; (2) Indicating otherwise inappreciable weights; (3) Recording pressures of air in motion, thus affording a useful addition to the anemometer.

Tasman, Abel Janssen, a Dutch navigator; born probably in Hoorn, about 1600. Commissioned by Van Diemen, the governor of the Dutch Indies, to explore the S. coast of the Australian continent, he left Batavia with two ships, Aug. 14, 1642; passed Mauritius Oct. 8, and on Nov. 24 discovered a coast which he called Van Diemen's Land, but which is now known as Tasmania. He sailed along its S. and E. coasts without being aware of its insular character, and proceeding further E. discovered (Dec. 13) the S. island of New Zealand (Jan. 6), the Fiji Islands, returning to Batavia June 15, 1643. His account of this voyage was reprinted at Amsterdam in 1722. On Jan. 29, 1644, he set out on a second voyage to explore the coasts of New Guinea and Australia, from which he never returned.

Tasmania, formerly Van Diemen's Land, an island in the Southern Ocean, 100 miles S. of Australia, from which it is separated by Bass Strait; greatest length, 186 miles; mean breadth, 165 miles; area, 26,385 square miles; pop. (1901) 172,475; (1910) 186,860. The capital is Hobart on the S. coast; pop. (1901) 24,655. Second largest town Launceston, on the N. coast; pop. (1901) 18,077.

Topography.—The island may be roughly described as heart-shaped. The coasts, which are all much broken and indented, have some excellent harbors. The islands belonging to Tasmania are numerous, the principal being the Furneaux group, on the N. E. extremity. Tasmania is traversed by numerous mountain ranges, the chief summits of which are Mount Humboldt, 5,520 feet; Mount Wellington, 4,195 feet; and Ben Lomond, 5,002 feet. The prevailing rocks are crystalline, consisting of basalt, granite, gneiss, quartz, etc. The chief rivers are the Derwent the Huon, the Arthur, and the Tamar. The chief lake is Lake Westmoreland which covers an area of 28,000 acres; Lake Sorell, 17,000 acres; Lake St. Clair, 10,000 acres.

Climate.—The climate is very mild. Mount Wellington is frequently covered with snow in the summer months; but at Hobart, in its immediate vicinity, snow never falls. In December, January, and February, the summer months, during which there is little rain, the average temperature is 62°, extreme 100° to 110°. The mean temperature throughout the year is about 55°.4. The average rainfall is about 24.05 inches.

Agriculture.—Much of the soil of Tasmania is well adapted for cultivation. Wheat, oats, barley, potatoes, peas, beans, and hops are largely cultivated, and the fruit includes grapes, cherries, plums, quinces, mulberries, peaches, apricots, walnuts, filberts, almonds, etc. Fruit-preserving forms an important industry. In 1899 there were 258,542 acres under crop, and 238,799 acres under permanent artificially sown grasses. Of the total area, 4,777,640 acres had been sold or granted to settlers by the government up to the end of 1898; while 852,298 acres had been leased as sheep runs. In 1898–1899 the total area under fallow was 34,926 acres; 12,277 acres were devoted to horticulture.

Zoölogy.—Kangaroos and other herbivorous animals of the pouched kind are numerous. There are two marsupial carnivorous animals called the Tasmanian wolf and the Tasmanian devil, both of which are destructive to sheep. The natural forests are chiefly of the eucalyptus or gum tree, pine, and acacia tribe.

Mineralogy.—Among the minerals are gold, silver, copper, iron, tin, coal, freestone, limestone, and roofing slate. Smelting works have been erected at Hobart for the iron which abounds in that district.

Commerce.—The staple export from Tasmania is wool, and the other articles include gold, tin, timber, grain, fruit, hides, and bark. In 1898 the total exports amounted to $9,016,845, the total imports to $8,250,090. The first line of railway was opened in 1871, and at the end of 1898 there were 508¼ miles open for traffic. At the end of 1898 the government had 1,927 miles of telegraph line in operation, with 258 stations, and 705½ miles of telephone wire.

Government.—The colony is divided into 18 counties, which are again subdivided into parishes. Another division is into electoral districts for returning members to the leg-

islative council and house of assembly. The constitution is settled by the Act 18 Victoria (1854), supplemented by acts passed in 1871 and 1885, by which are constituted a legislative council and house of assembly, called the Parliament of Tasmania. The legislative council is composed of 18 members, and the house of assembly of 36 members, the latter being elected for five years. The governor is appointed by the crown, and he has a responsible cabinet of four official members, the colonial secretary, treasurer, attorney-general, and minister of land and works.

Religion.— The majority of the colonists belong to the Church of England, which in 1891 numbered 76,082; Roman Catholics 25,805; Wesleyan Methodists 17,150; Presbyterians 9,756; and there are several smaller bodies. The government contributes $875 per annum for religious purposes. Education is compulsory, and the higher education is under a council, who hold examinations and grant degrees.

History.— Tasmania was discovered in 1642 by Abel Jansen Tasman, who named it after Van Diemen, the governor of the Dutch East Indies. It was visited by Cook in 1769, and during the next 20 years by various navigators. In 1797 Bass discovered the strait which has been called after him. The first settlement was made in 1803 by a guard with a body of convicts, who settled at Restdown, but afterward removed to the site now occupied by Hobart. The development of the country made slow progress till the land was divided into small allotments and farming stock and government pensions reckoned as capital. Convict labor was supplied, and at a very moderate expense farms were cleared for cultivation. Sheep, cattle, and horses were introduced, and the raising of stock has always been carried on with great success. Till 1824 Tasmania was a dependency of New South Wales, but in that year it was made an independent colony. For a series of years the prosperity of the colony was retarded by the hostility of the natives and the depredations of escaped convicts, known by the name of bush-rangers. The aborigines have ceased to exist, in 1853 transportation was abolished, and about the same time the name of Tasmania was officially adopted on the petition of the colonists. When gold was discovered in Australia in 1851, a rapid emigration from Tasmania to Australia began to take place. This gave a check to its prosperity, but it is now quite prosperous. In 1901 it became a State in the Australian Commonwealth.

Tasmanite (after Tasmania, where found), a name given by Church to some small disks, occurring thickly distributed through a laminated shale; hardness, 2.0; sp. gr., 1.18; luster, resinous; color, reddish-brown. Insoluble in alcohol, ether, benzole, etc. Composition: Carbon, 79.21; hydrogen, 10.23; sulphur, 5.28; oxygen, 5.28 = 100. The name is more frequently, though erroneously applied to the shale itself.

Tasmannia, a genus of plants, consisting of one Tasmanian and two Australian shrubs, natural order *Magnoliaceæ*. The Tasmanian species, *T. odorata*, possesses aromatic qualities, particularly in its bark. Its fruit is used by the colonists for pepper.

Tasman Peninsula, a peninsula at the S. extremity of Tasmania; 24 miles long and 18 broad. Capes Raoul and Pillar form its S. E. and S. W. extremities.

Tasman Sea, a name given to that part of the Pacific inclosed by Australia and Tasmania on the one side, and New Zealand and smaller islands on the other.

Tasso, Bernardo, an Italian epic and lyric poet, father of the more famous Torquato; born in Venice, Italy, Nov. 11, 1493; was educated with great care; entered the service of Guido Rangone, general of the Pope, as a political emissary; and became secretary to the Prince of Salerno, whom he accompanied to Tunis. In 1539 he married Porzia de Rossi and retired to Sorrento. Subsequently he received the patronage of the Duke of Urbino, and in 1563 the Duke of Mantua appointed him governor of Ostiglia. He published numerous lyric poems, but his chief work is the epic "L'Amadigi," founded on the story of Amadis de Gaul. He died in Ostiglia Sept. 4, 1569.

Tasso, Torquato, an Italian epic poet, son of the preceding; born in Sorrento, Italy, March 11, 1544. He was early sent

TORQUATO TASSO.

to the school of the Jesuits at Naples, and subsequently pursued his studies under his father's superintendence at Rome, Bergamo,

Urbino, Pessaro, and Venice. At the age of 16 he was sent to the University of Padua to study law, but at this time, to the surprise of his friends, he produced the "Rinaldo," an epic poem in 12 cantos. The reputation of this poem procured for Torquato an invitation to the University of Bologna, which he accepted. Here he displayed an aptitude for philosophy, and began to write his great poem of "Gierusalemme Liberata" (Jerusalem Delivered). While engaged on it he secured a patron in Cardinal Louis d'Este, to whom he had dedicated his "Rinaldo." He was introduced by the cardinal to the court of Alfonso II. of Ferrara. Here he remained from 1565 to 1571, when he accompanied the cardinal on an embassy from the Pope to Charles IX. of France. Having quarreled with his patron, Tasso returned to Ferrara, and in 1573 brought out the "Aminta," a pastoral, which was represented at the court. In 1575 he completed his epic of "Gierusalemme Liberata."

About this time he became a prey to morbid fancies, believed that he was persistently calumniated at court, and systematically misrepresented to the Inquisition. To such a pass, indeed, had this mania come in 1577 that the poet drew his poignard on one of the domestics of the Duchess of Urbino. He was immediately arrested, but was set at liberty after two days' confinement. At his own request he returned to Ferrara, to the convent of St. Francis; but from here he made his escape, and traveled in disguise to his native place, Sorrento, where he stayed with his sister Cornelia. He again asked permission to return to Ferrara, a request which the duke coldly granted. But in his excited and jealous condition of mind Tasso found it impossible to reëstablish the old friendly relationship at the court. He fled from Ferrara again, but again returned. So outrageous had his conduct now become that he was seized by the duke's orders and confined as a madman in the hospital of St. Anne at Ferrara. Here he remained from 1579 to 1586, till he was released at the solicitation of Vincent di Gonzaga. Broken in health and spirit, he retired to Mantua, and then to Naples. Finally, in 1595 he proceeded to Rome at the request of the Pope, who desired him to be crowned with laurel in the capitol, but the poet died on April 25, while the preparations for the ceremony were being made. Tasso wrote numerous poems, but his fame rests chiefly on his "Rime," or lyrical poems, his "Aminta," and his "Gierusalemme Liberata" (translated into English by Fairfax). His letters also are interesting.

Tassoni, Alessandro, an Italian poet; born in Modena in 1565; studied law in Bologna and Ferrara; became secretary of Cardinal Colonna in 1597; and accompanied him to Spain in 1600. In 1612 he entered the service of Carlo Emanuele of Savoy, for whom he had a high regard, but he was soon forced by the intrigues of his political enemies to give up his post. In 1626 he obtained the office of secretary to Cardinal Lodovisio, and after the cardinal's death was appointed in 1632 chamberlain to Francis I. of Modena. By his hostile "Considerazioni sopra le Rime del Petrarca" (Modena, 1609) he acquired the name of "Petrarchomastix"; in his "Pensieri Diversi" (Rome, 1612) he made a similar attack on Homer and Aristotle, and maintained that in everything — in literature as well as in science — the moderns had the preëminence; and in the "Sacchia Rapita" (Paris, 1622), a mock-heroic poem ostensibly describing the contest that arose from the rape of a Bolognese bucket by the people of Modena, he treats everything ancient as old-fashioned, and indulges in hilarious but cynical mockery of the general round of human life. His patriotism was severely wounded by the encroachments of the Spanish power, and in his "Filippiche" (Lat. ed. 1878), and his "Manifesto" (1855), he laments the decay of Italian independence. He died in Modena in 1635. The "Secchia Rapita" is his most popular work; it is regularly reprinted from time to time.

Taste, one of the special senses. The parts of the mouth affected by sapid substances are the surface and sides of the tongue, the roof of the mouth, and the entrance to the pharynx. The mucous membrane is invested by stratified squamous epithelium, which, over the surface of the tongue, covers little vascular projections termed papillæ. One can see the papillæ of the sides and upper part of the tongue with the naked eye, as little sharp or rounded projections; the latter, thickly clustered at the tip and sides, may appear, if the system is out of order, as little red points like those of a strawberry. In the cat tribe the papillæ are hard and curved backward into the mouth, so that the animal can use the tongue as a scraper to remove the flesh from the bones of its prey. The pointed papillæ are termed "filiform." They are essentially the same in structure, differing alone in shape and size. At the back of the tongue are some 8 or 10 papillæ of quite a different nature, called "circumvallate." They are arranged to form a V with its angle pointing backward. These are hardly papillæ at all, but may be looked on rather as tiny patches of mucous membrane trenched out from the surrounding parts.

Into these trenches Ebner's glands secrete a watery albuminous fluid, keeping them perpetually moist and free from foreign

Taste

particles. In the epithelium lining these trenches curious little bodies called taste bulbs are lodged; and, as these are the parts which are probably more especially concerned in taste, they must be carefully described. Each taste bulb looks like a flask-shaped barrel or box, the walls of which are composed of flat elongated epithelial cells fitted side by side like the staves of a cask. The taste bulbs open each by a little pore into the trench, and into the deeper part a nerve enters. The cask is probably for the protection of the sensory cells which it contains. These cells are much elongated, and end each in a tiny bristle which projects with those of their companion cells from the little pore into the trench, and is here moistened by the juice of Ebner's gland and whatever sapid substance may be present. The impressions which these sensory cells receive from the bristles, say by the action of a bitter like "hops," is carried by the delicate nerve which starts from the opposite end of the cell out of the taste bulb directly to the brain. Within each taste bulb are other cells, which separate and support the sensitive cells, and are similar to analogous structures seen in the sensory epithelium of the eye, and nose, and ear.

While it is almost certain that these taste bulbs are organs of taste, it is not equally certain that other parts are not involved. The reason for this belief is that in the front and sides of the tongue these taste bulbs are few in number, while in these regions taste sensations are pretty acute. It is therefore not improbable that the nerves which abundantly pass into the epithelium of the tongue end in other ways, but unfortunately we are at present much in the dark concerning their exact method of termination. It is to be noted that the protective layer of the mucous membrane is thin, and might conceivably be permeated readily by the juices of the mouth, which would reach the lower cells into which some of the nerves certainly pass. From the mucous membrane of the mouth the impressions produced by sapid substances are carried probably by fibers belonging to the fifth nerve. These fibers, though they belong to this nerve, are found to run in the greater part of their course in other nerve trunks — viz. the glosso-pharyngeal, to the back of the mouth and tongue, and the chorda tympani to the front of the tongue.

Having sketched the mechanism concerned in the production of taste sensations, we can now turn to the discussion of the many interesting facts which may be observed when this mechanism is called into play. In the first place, it may be remarked that substances capable of dissolving in the juices of the mouth are alone tasted. Marble, wood, flint, are devoid of taste, and so is pure starch; these are all of them quite insoluble in water. By the aid of various means we can convert the last-named substance into a very soluble "dextrine," yet this is tasteless. Another chemical product of the starch is a soluble substance termed "dextrose," which has a sweet taste and is commonly termed "grape sugar." These examples will serve to illustrate the general fact that substances to be tasted must be in solution, though not all soluble substances are capable of giving rise to this sensation. It is a matter of general experience, that if a substance like sugar be simply placed in the mouth and allowed to dissolve, its taste is only faintly evident. If, however, the juices of the mouth, sweetened by the sugar, be rubbed into the mucous membrane by moving the tongue against the palate, the sensation is greatly intensified. One invariably "smacks the lips" in trying to appreciate the qualities of a taste, and obtains in this way its maximum effect.

A fact that is hardly known by the laity is that most of the so-called tastes are really "smells." Sugar, salt, quinine, and some acids are devoid of smell; we could not distinguish them except by the tongue itself, and we have in these the prime taste sensations of sweet, salt, bitter, and acid. Meat, wines, and fruit are smelt, not tasted, and a bad cold dulls our appreciation of these articles of diet. To the prime taste sensations already mentioned may be added perhaps alkaline, astringent, and metallic tastes, but when all is told this organ yields us rough results when compared with smell, sight, or hearing, whereby hundreds and thousands of shades of quality are readily perceived in the odor of flowers, the lights from colored objects, and the sounds from an orchestra. The various taste sensations are not equally produced on stimulating the whole of the gustatory area, and indeed each taste seems to have some special locality at which it is most acutely felt. If we take a piece of quassia or a hop leaf and chew it, we shall at first be unconscious of taste, and it is only when the juice of the mouth laden with these bitter principles passes to the back of the mouth that the taste is felt at all. This is why we drink beer in the draught, and do not sip it like wine. The sweet or acid wine is tasted best by the front part of the tongue, while the bitter beer is only appreciated as it is going down the throat.

As in the other senses, anything that stimulates the gustatory nerve gives rise to a sensation; and though sapid particles effect this best of all, electrical or even mechanical stimuli have some effect. If we place a piece of zinc and coper on the tongue, and join them so as to give rise to a feeble current, or still better, if a slight interrupted electrical current be passed through the mucous membrane of the

tongue, metallic saline tastes are produced. These are possibly due to electrolytic changes and not to direct stimulation, though this is less likely to be the case with the induced currents, equally powerful in the production of sensation. It is often stated that a sharp tap on the tongue produces a sweet or saline taste; this is, however, an experiment which often fails. If we rub the back and side of the tongue with the finger tip we shall hardly fail to notice a bitter taste, and it is probable that we shall question the cleanliness of the finger used. A scrupulously cleaned glass rod gives rise, however, in equal measure to the same sensation, and we are forced to conclude that the mechanical stimulus of the rod calls forth that taste which has its seat in the back of the mouth and tongue.

Our knowledge of what really takes place when an external agency affects the senses, sets up a nerve motion which travels to the brain and there induces a sensation, is very limited. Perhaps in the case of hearing our knowledge is most precise, and there are grounds for believing that the sound-waves mechanically set in motion appropriate structures within the ear, just as a note sung before the piano will cause certain of its strings to vibrate. The light affects the eye in a manner at which we are at present only guessing; but it can be said that our different color sensations depend on the stimulation of the retina by ether vibrations of different pitch and complexity. In this respect then sight and hearing are both alike, and we have outside the body media capable of vibrating at different periods, and the kind of vibration determines the kind of sensation produced. As to taste and smell, till lately nothing whatever was known which would explain in any rational way their production. When Newlands, Lothar Meyer, and Mendeléeff discovered what is termed the Periodic Law in chemistry, it occurred to an English scientist to see if this law holds good for taste and smell; this was found to be the case (see "Proceedings" of the Royal Society of Edinburgh, 1885–1886; and "Brain," 1886). Newlands found that if we arrange the elements in a series, beginning with that one which has the lowest and passing to that which has the highest atomic weight, a periodic recurrence of function or property is found.

There is a general resemblance in physical properties between the 1st, 8th, 15th, etc., and between the 2d, 9th, 16th, etc. Those elements picked out of the series from their resemblance and periodic recurrence Mendeléeff arranged in groups (see ATOMIC THEORY), and found that similar compounds of these elements have similar tastes. To take an example (group 1), the chlorides of lithium, sodium, potassium, rubidium, cæsium are all salt, while the sulphates of these elements are all saline bitters. It is evident that this group of elements, similar in their physical properties, can also produce similar tastes, and we can correlate taste a physiological effect with some common physical quality.

Carnelly has shown that salts of elements belonging to the same group, if colored, have colors which are related in this respect, that as we ascend the group the color always approaches more and more to the red end of the spectrum. This, as it is unnecessary to point out, indicates molecular vibration of similar and related pitch, and in this case, alike in taste, smell, hearing, and sight, we have this common fact, that the stimulus is vibratory, and associated with the kind of this vibration is the quality or kind of sensation produced. Another very curious point is that, as in the case of hearing and smell, both very high and very low vibrations are unfelt. Bodies like albumen and starch are devoid of taste, even when converted into very soluble peptone and dextrine. When these molecules are broken up, then sapid substances may be produced such as sugar. Substances such as water and watery solutions of gases, like high-pitched notes or the ultra-violet rays of the spectrum, are incapable of producing sensations, and sulphuretted hydrogen on the border land has a faint acid taste. Like smell, the sense of taste is placed at the entrance of the alimentary canal, and affords us knowledge of the nature of the food about to be eaten. We have so far adapted ourselves to our environments that, as a rule, those substances which please these senses are salutary foods, and the converse is equally true. This is, however, a rule with many exceptions, and it is perhaps one of the most anxious parts of a child's training, that of teaching by the eye those natural products which are injurious or even of a poisonous nature.

Tate, Nahum, an English poet; born in Dublin, Ireland, about 1652; received his education in Trinity College; and went to London, where he engaged in literary pursuits, and was appointed poet laureate. He was the author of several dramatic pieces; assisted Dryden in the second part of "Absalom and Achitophel"; altered and arranged Shakespeare's "King Lear" for the stage; and wrote, in conjunction with Dr. Nicholas Brady, the metrical version of the Psalms which used to be appended to the English Book of Common Prayer. He died in London, England, Aug. 12, 1715.

Tatian, a Christian apologist; born early in the 2d century (110, Zahn); was an Assyrian by birth; studied Greek philosophy; and wandered about as a sophist round the Roman world; but about 150 at Rome were won to Christianity by the simple charm of the Old Testament Scrip-

tures and the example of the purity and courage of the Christians. He became a disciple of Justin, in whose lifetime he wrote his "Oratio ad Græcos," a glowing and uncompromising exposure of the faults of heathenism as compared with the new "barbarian philosophy." After Justin's death (166) Tatian fell into evil repute for heresies, and he retired to Mesopotamia, probably Edessa, writing with characteristic fearlessness and vigor, treatise after treatise, all of which have perished. He was certainly infected with gnostic notions of the universe, the supreme God, the demiurge, and the world of æons; but the notions of his which gave most offense were his excessive asceticism, his rejection of marriage and animal food, and adoption of the practices of the Encratites. His name became a synonym for all manner of dangerous and unsettling tendencies, and his doctrines were assailed in turn by Irenæus, Tertullian, Hippolytus, Clement of Alexandria, and Origen. Neither the place nor date of his death is known, but it took place perhaps at Edessa, and probably about 180.

Of his writings one maintained a place of importance in the Syrian Church for 200 years, and supplies one of the most interesting chapters in the history of sacred literature. This was the "Diatessaron," a gospel freely constructed out of the four gospels known to us, not a harmony in the modern sense, but a kind of patchwork gospel, its principle amalgamation not comparison in Lightfoot's phrase. This Harnack thinks was written in Greek; but Zahn and most other scholars, among them Lagarde, Bäthgen, Lightfoot, and Hilgenfeld, in Syriac. There is no mention of the "Diatessaron" in any Latin writer before the middle of the 6th century, when Victor of Capua attributes an anonymous gospel harmony he had found to Tatian, neither Cassiodorus, Gelasius, Jerome, Augustine, or Juvencus so much as naming it. Of Greek writers the first to mention it is Eusebius; "Tatian composed a sort of connexion and compilation, I know not how, of the gospels. * *

* This work is current in some quarters even to the present day." Zahn thinks from this that Eusebius had never himself seen it, but, knowing Tatian to have been a heretic, thought his compilation a mere distorted gospel like that of Marcion and Gnostic teachers. Epiphanius says, "the 'Diatessaron' gospel is said to have been composed by him [Tatian]. It is called by some the gospel according to the Hebrews."

But on Syrian soil in Theodoret, bishop of Cyrrhus, near the Euphrates, we first find (453) an explicit account of the book: "He [Tatian] composed the gospel which is called 'Diatessaron,' cutting out the genealogies and such other passages as show the Lord to have been born of the seed of David after the flesh. This work was in use not only among persons belonging to his sect, but also among those who follow the apostolic doctrine, as they did not perceive the mischief of the composition, but used the book in all simplicity on account of its brevity. And I myself found more than 200 such copies held in respect in the churches in our parts. All these I collected and put away, and I replaced them by the gospels of the four evangelists." Thus we see that in the 5th century this work was used in the Syrian churches as the form in which the gospel was read, and further back still we find evidence of its use in the 3d century "Doctrines of Addai" (Cureton's "Ancient Syriac Documents," 1864, and G. Phillips, Syr. and Eng. ed. 1876), and in the "Homilies" of Aphraates (fl. 340) and the famous Ephraem Syrus. The Syriac text of the "Homilies" of the former was edited by Professor Wright in 1869, and Zahn has proved that the key to the difficulty of his gospel citations is the fact that he used the "Diatessaron." Bar-Salibi, a Syrian bishop (12th century), distinctly states that Ephraem wrote an exposition of Tatian's "Diatessaron." Lightfoot printed his famous article on Tatian (May, 1877), ignorant of the fact that a year before Dr. Moesinger of Salzburg had published at Venice a Latin translation of the same commentary, made as early as 1841 by Father Aucher of the Mechitarist monastery of San Lazzaro from the Armenian edition of Ephraem's works published in 1836 (4 vols.). The first scholar to make this remarkable discovery widely known was Ezra Abbot in his "Authorship of the Fourth Gospel" (1880). Next year Westcott noticed it in the 5th ed. of his "History of the N. T. Canon," and Professor Wace began his series of articles in the "Expositor."

Aucher and Moesinger believe this Armenian version to have been made about the 5th century, and to be a translation from the Syriac, and from the whole facts of the case the constructive argument is so strong that we may without hesitation accept this as the work of Ephraem, and conclude that the basis of this commentary is a gospel harmony, and that the "Diatessaron" of Tatian.

Again, the Latin harmony of Victor of Capua, as it still exists in the "Codex Fuldensis" (published by Ranke, 1868), on examination was found to be substantially identical with the fragments of Ephraem. In 1881 Zahn published his masterly monograph on Tatian's "Diatessaron," containing a reconstruction of the text from the Latin, based on Moesinger's Latin version of Ephraem's Commentary, on the quotations in Aphraates, and occasional parallels with the "Codex Fuldensis." He showed that Tatian's original Syrian text

agreed in great part with the Curetonian Syriac, and evidently preceded the Peshito or reformed Syriac text. The fresh interest thereby aroused in the question led Ciasca of the Vatican Library to examine anew the Arabic MSS. there. The existence of one was already known, it having been partially described by Assemani, Rosenmüller, and Akerblad. In 1886 Antonios Morcos, vicar-apostolic of the Catholic Copts, forwarded to Rome a 9th-century MS., which Agnostino Ciasca edited for the jubilee of Pope Leo XIII., and this was found both in contents and arrangement to correspond with the work edited by Moesinger.

Harnack thus sums up the conclusions that may be drawn from what may be considered as proved: (1) In Tatian's time there was still no recognized New Testament Canon, and the texts of the gospels were not regarded as inspired. (2) About 160 of our four gospels were already in existence and authoritative, and the fourth on an equality with the three synoptics. (3) The text of the gospels in 160 was substantially the same as it is now, save that intentional changes and interpolations were made later, as the passage about the church being built on Peter the rock.

Tatius, Achilles. See ACHILLES TATIUS.

Tatouay, a kind of armadillo (*Dasypus tatouay,* or *Xenurus unicinctus*) remarkable for the undefended state of its tail, which is devoid of the bony rings that inclose this member in the other armadillos, being only covered with brown hair.

Tatta, a town in the district of Karachi, Sind, British India; 4 miles W. of the Indus, and 60 miles E. of Karachi; was formerly a place of great historical importance, but has been devastated by wars and malaria. It still has a special manufacture of *lungis,* or scarfs of mixed cotton and silk. Tatta contains a ruined fort and a handsome mosque, the Jumma Musjid, said to have been built by Shah Jehan. Pop. about 9,000.

Tattersall's, a celebrated mart in London for the sale of racing and other high-class horses, and one of the principal haunts of racing men, so called from Richard Tattersall (1724–1795), a native of Hurstwood in Lancashire, who came early to London, entered the service of the 2d Duke of Kingston, and ultimately became an auctioneer. In 1766 he took a 99 years' lease from Lord Grosvenor of premises in Hyde Park Corner, and after its expiry Tattersall's was removed to Knightsbridge Green (1867). In 1779 Richard Tattersall bought the famous horse Highflyer of Lord Bolingbroke for $12,500, and named his house at New Barns near Ely Highflyer Hall. Here he was often visited by the Prince of Wales from Newmarket.

Tattie, a screen made of split bamboo placed vertically in doors and windows in India (the window frames being temporarily taken out) while the dry hot wind is blowing during April, May, and June. A native with a pail of water stands outside drenching the mat, so that every interstice has a drop of water. As the dry wind blows into the house through these drops, evaporation takes place with such speed as to cool the wind, which enters the house at a temperature quite refreshing. A single pane of glass is sometimes placed in the window tattie to afford the inmates of the room a small amount of light. When the hot season is succeeded by the rainy season, the tatties are removed, as the wind is already saturated with moisture, and the temperature does not require to be artifically reduced.

Tattnall, Josiah, an American military officer; born in Bonaventura, Ga., in 1762; went to England with his parents who were Loyalists, on the outbreak of the Revolutionary War, but ran away from home in 1770; returned to Georgia, and joined the army under Gen. Nathanael Greene. He was made colonel of militia in 1793 and Brigadier-General in 1800; took an active part in the military affairs in the State; was elected to the Legislature, and was United States Senator from Georgia in 1796–1799 and governor of that State in 1800. He died in Nassau, New Providence, June 6, 1803.

Tattnall, Josiah, an American naval officer; born near Savannah, Ga., Nov. 9, 1795. He served in the War of 1812; in the Algerine War; in the West Indies; and in the Mexican War. In 1857 he was appointed flag-officer of the Asiatic station. While in the East he violated the law of neutrality by aiding the British in an attack on a Chinese fort, but in this was sustained by his government. During the Civil War he was made a captain in the Confederate navy and in 1862 succeeded Franklin Buchanan in command of the "Merrimac." In the same year he destroyed the ship to prevent her falling into the hands of the Federals. He died in Savannah, Ga., June 14, 1871.

Tattoo, a beat of drum and bugle-call at night, giving notice to soldiers to repair to their quarters in garrison or to their tents in camp.

Tattooing, the custom of marking the skin with figures of various kinds by means of slight incisions or punctures and a coloring matter. The word itself is Tahitian (*ta,* "a mark"), but the practice is very widely spread, being universal in the South Sea Islands, and also found among the North and South American Indians, the Dyaks, the Burmese, Chinese, and Japanese, and common enough still among civil-

ized sailors. It is expressly forbidden in Scripture (Lev. xix: 28), from which it is to be concluded that it was common among the neighboring nations. Undoubtedly the main cause of its origin was the desire to attract the admiration of the opposite sex,

TATTOOED MAORI CHIEF.

but this fundamental human desire does not of course exclude motives for tattooing for religious or other ceremonial purposes, or for mere ornament apart from sexual considerations. Among the Polynesians the operation is attended with circumstances of ceremony, and the figures represented are often religious in signification or symbolic of rank, not seldom the totem or special tribal badge. The New Zealanders were distinguished by elaborate tattooing of the face, and many of their heads are preserved in European museums. As it was formerly a common custom for shipmasters to pur-

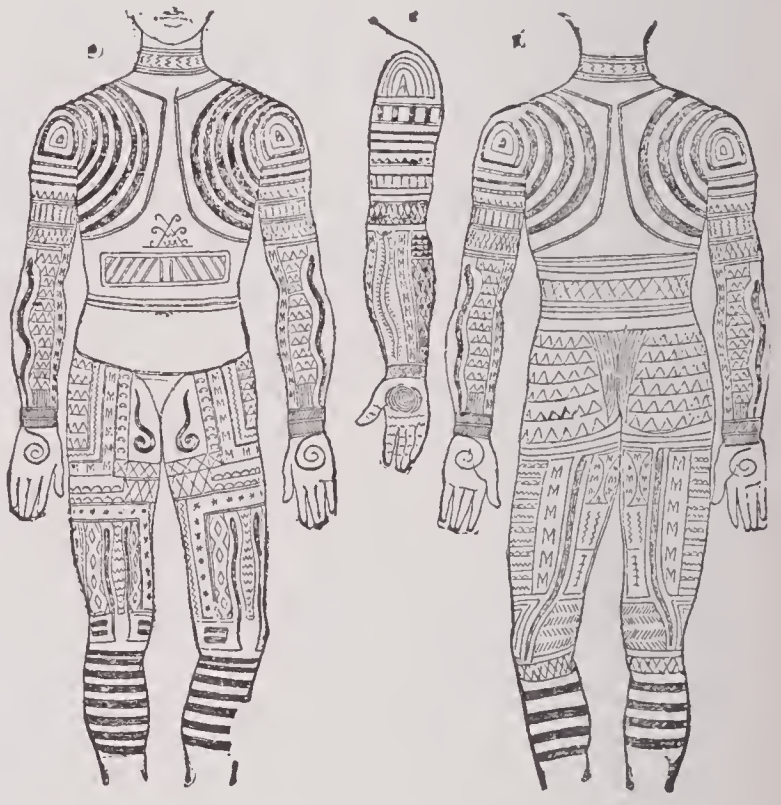
TATTOOED BOY AND GIRL, QUEENSLAND.

chase these on visiting New Zealand there is little doubt that the demand stimulated the supply.

Dr. Wuttke labors to prove that tattooing is a kind of writing, but, whatever may be the case elsewhere, its origin in Japan, where it reached its greatest perfection, is neither ceremonial nor symbolical, but merely cosmetic. Its end is to take the

Tattooing

part of a garment or decoration, those parts of the body only being tattooed which are usually covered, and only in the cases of such workmen as runners, grooms, bearers, who work in a half-nude state. Still further, this is found only in large and civilized towns where nudity might have been objectionable. It was a substitute for clothing, but now that clothing is compulsory in Japan it has lost its meaning, and may be expected to disappear. Dr. Baelz, writing in 1885, estimated that a few years before there were in Tokyo alone as many as 30,000 men who were tattooed. The head, neck, hands, and feet are never tattooed, and it is found among the lower classes alone, and very seldom among women, and these only the dissolute. The usual objects illustrated are large dragons, lions, battle scenes, beautiful women, historical in-

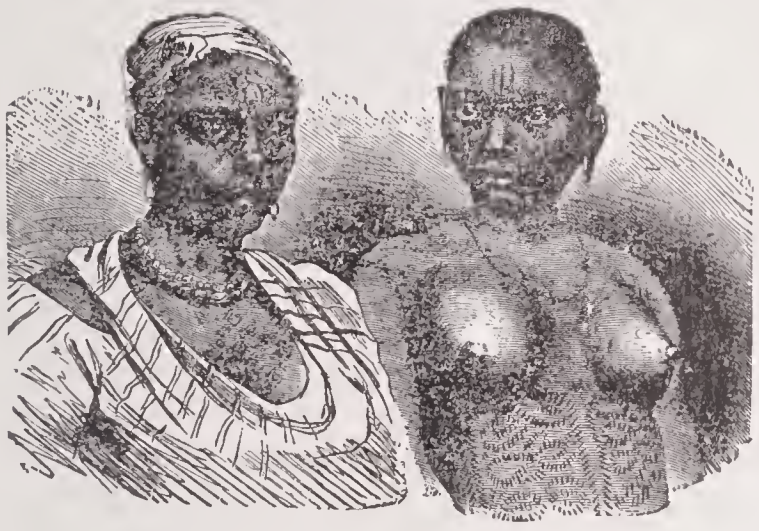


IGORROTO TATTOOING.

cidents, flowers — never obscene pictures. The colors employed are black, which appears blue, derived from Indian ink, and various shades of red, derived from cinnabar. The artist uses in his work exceedingly fine sharp sewing needles, fixed firmly 4, 8, 12, 20, or 40 together, and, arranged in rows in a piece of wood. The points are quite even, except when it is desired to produce a light or dark shading. A skillful artist can cover the whole back or breast and belly of a grown man in a day, and that with excellent pictures with various degrees of shading. These punctures are not very painful, and as soon as the operation is over the patient is bathed with hot water, which brings out the color more clearly. Among the Ainos again the tattooing is done on the exposed parts of the body, and largely practised by women. The Igorrotos

in the mountainous region above Luzon tattoo elaborately, but in series of lines and curves. They ornament the hands, arms, breast, and part of the legs, the back only in one tribe, and a favorite form is a picture of the sun as a number of concentric circles on the back of the hand. According to the Archduke Joseph of Austria, tattooing is unknown among the gypsies, but this is questioned by Bataillard and MacRitchie.

Many savages paint their skins as a means of protection against cold, or against the sun's heat or the bites of insects; others again attempt thus to make their aspect more terrible in war, as Cæsar tells us did the ancient Britons. Tattooing has often been employed as a badge of brotherhood in some cause, and more often still as a means of identification for slaves and criminals. The so-called branding of the letters D. and B. C. on military deserters and incorrigible characters, only given up in 1879, was merely tattooing with needles and In-



TATTOOED ABORIGINES.

dia ink. Among the relics of the ancient cave men of Europe are hollowed stones in which were ground the ochre and other colors for painting themselves. The war paint of the ancient Briton and Red Indian braves still survives in the paint-striped face of the circus clown; and the rouge of the faded "society" beauty is merely the civilized equivalent of the Maori women's tattooing round the mouth, or the beautiful flower-patterns on the backs and bellies of the Formosans. Among the lower-class criminal population in Europe the practice of tattooing is still common, but almost exclusively among males, more than 20 designs being sometimes found on the same individual — transfixed hearts, swords, serpents, flowers, initials, a woman's figure, and occasionally obscenities. Among 800 convicted French soldiers Lacassagne found 40 per cent. tattooed, many with inscriptions which gave an index to the criminal's attitude to the world.

Tatusia, in zoölogy, the sole genus of *Tatusiinæ,* with five species, from the lower Rio Grande of Texas to Patagonia. This genus differs from all other armadilloes in having a diphyodont dentition, and two pectoral mammæ, in addition to the pectoral pair, and in producing from 4 to 10 at a birth.

Tatusiinæ, in zoölogy, a sub-family of *Dasypodidæ,* with a single genus, *Tatusia.*

Tau (the Greek name of the letter *t*); in entomology, *Bombyx tau* of Fabricius transferred by Latreille to the genus *Attacus.* In heraldry, the Cross of St. Anthony, called also the Cross Tau. It derives its name from its resemblance to the Greek letter tau, and is somewhat like the cross potent. In ichthyology, *Batrachus tau,* the toad fish of Carolina.

Taubert, Emil (tou'bert), a German poet; born in Berlin, Prussia, Jan. 23, 1844. He wrote: "The Paradise of Youth: Poems for Young and Old" (1869); "The Clash of Arms" (1870); "Juventus; New Poems" (1875); "The Goldsmith of Bagdad"; "The Cicadas" (1880); "The Torso" (1881); also some stories, as "The Antiquary" (1882); "Sphinx Atropos" (1883); "The Magic Lantern" (1885); "Samson" (1886); "Wife and Bride" (1889). He died in Berlin, April 10 1895.

Tauchnitz, Karl Christoph Traugott (tou*h*'nits), a German printer and bookseller; born in Grosspardau, near Leipsic, Oct. 29, 1761. Bred a printer, he set up in 1796 a small printing business of his own in Leipsic, with which he shortly after conjoined publishing and typefounding, and all his enterprise only added to his prosperity. In 1809 he began to issue editions of the Greek and Latin classics, the elegance and cheapness of which carried them over the learned world. He was the first to introduce (1816) stereotyping into Germany, and he also applied it to music. On his death Jan. 14, 1836, the business was continued by his son, Karl Christian Philipp Tauchnitz (1798–1884). A nephew of the elder Tauchnitz, Christian Bernhard, Baron von Tauchnitz, born in Schleinitz Aug. 25, 1816, also founded in 1837 a printing and publishing house in Leipsic. In 1841 he began his well-known collection of "British Authors," of which 2,600 volumes appeared within the first 50 years. The enterprising publisher was ennobled in 1860, and made one of the few Saxon life-peers in 1877. He died Aug. 14, 1895.

Tauler, Johannes (tou'ler), a German mystic and writer; born in Strasburg, about 1300. He entered the order of the Dominicans about 1318; studied theology at their college in Cologne, and afterward in Paris. He was banished with them from Strasburg, and went to Basel in 1339. He was reputed the greatest preacher of his time. His ser-

mons were collected in 1498. He died in Strasburg June 16, 1361.

Taunay, Alfredo D'Escragnolle (tō-nā′), a Brazilian author and statesman; born of French parents in Rio de Janeiro, Brazil, Feb. 22, 1843. In 1865–1868 he was attached to the engineer corps of the Brazilian army which invaded Paraguay, and described the history of the campaigns in "Scenes of Travel" (1868), and "The Retreat from Laguna" (1871). Besides filling many important political positions, he wrote essays, poems, comedies, criticisms, and a series of novels considered the best ever produced by a Brazilian novelist; among which is "Innocence," translated into French and English.

Taunton, a city and county-seat of Bristol co., Mass.; on the Taunton river, and on the New York, New Haven and Hartford railroad; 36 miles S. of Boston. It contains a public library, court house, United States government building, State Hospital for the Insane, waterworks, electric lights, electric street railroads, National and savings banks, and several daily, weekly, and monthly periodicals. Taunton is a noted manufacturing city, having numerous cotton mills, machine and printing-press works, foundries, nail and tack mills, brick and tile works, stove and furnace works, an extensive britannia-ware plant, a jewelry factory, copper works, shoe-button factories, and locomotive works. The assessed property valuation is nearly $21,000,000. The city became an incorporated town in 1639, and was chartered as a city in 1864. Pop. (1900) 31,036; (1910) 34,259.

Taunton, a town in Somersetshire, England; in the valley of the Tone; 45 miles S. W. of Bristol. Here about 710, Ine, the West Saxon king, built a fortress, which, passing with the manor to the bishops of Winchester, was rebuilt by Bishop William in the first quarter of the 12th century. Added to in the 13th and 15th centuries, this castle received Perkin Warbeck (1497), and was held by Blake during his famous defense of the town (1644–1645). In its great hall, fitted up now as a museum, Judge Jeffreys opened the "Bloody Assize," hanging 134 and transporting 400 of the inhabitants of Taunton and the neighborhood who had accorded Monmouth an enthusiastic welcome (1685); and here too Sydney Smith made his "Mrs. Partington" speech (1831). The church of St. Mary Magdalene has a noble Perpendicular tower 153 feet high (about 1500; rebuilt 1858–1862); and other buildings are the Elizabethan shire hall (1858), the municipal buildings (formerly the grammar school founded by Bishop Fox in 1522), King's College school (1880), Independent college (1847–1870), Wesleyan Institution (1843), Huish schools (1874), Bishop Fox's girls' school, hospital (1809–1873), barracks, etc. Formerly one of the great "clothier towns" of Somerset, Taunton now has shirt, collar, glove, and silk manufactures, with a large agricultural trade. Pop. (1901) 21,087.

Taunton, River, a small river in Massachusetts, which rises in Plymouth county, flows S. W. through Bristol county, and empties into Mount Hope Bay (Narragansett Bay) at the city of Fall River. It is navigable to Taunton and affords extensive water power.

Taunus (tou′nös), a mountain range of Western Germany, mainly in the Prussian province of Hesse-Nassau, extending E. from the Rhine, N. of the Main; highest summit, Great Feldberg, 2,886 feet. It is well wooded, and exhibits much picturesque scenery.

Taurida, a province of Southern Russia, which includes the peninsula of the Crimea; bounded on the E., S., and S. E. by the Sea of Azov and the Black Sea; area, 23,312 square miles; pop. (1908) 1,789,700. The greater part of it belongs to the Nogai Steppe, only $\frac{9}{11}$ being under cultivation, and at least a half unenclosed pasture land. From the steppe there is a gradual rise through the Isthmus of Perekop to the Crimea, some of whose ranges attain an elevation of 5,000 feet. The only river of importance is the Dnieper, which forms the N. W. boundary. Salt lakes abound on the treeless steppes. Vines and orchard trees are cultivated to a certain extent, but cattle-breeding is the main employment of the inhabitants. The population is very mixed, about one-third of the whole being Little Russians, 100,000 Nogai Tartars, 50,000 German colonists, 22,000 Bulgarians, 15,000 Jews, 14,000 Greeks, and 11,000 Armenians. The chief towns are Simferopol the capital, Sebastopol, Feodosia, and Kertch.

Taurids, meteors which appear about Nov. 20, and which have their radiant in Taurus. Fire balls are occasionally seen among them.

Taurine, $C_2H_7NSO_3$, a beautifully crystallizable substance, prepared by boiling dilute hydrochloric acid with taurocholic acid; one of the constituents of bile. It may also be prepared by heating isethionate of ammonia (NH_3,H_2O,C_2H_4,SO_3), which loses its water. This salt not only has a composition apparently made up of the union of ammonia, water, olefiant gas, and sulphuric anhydride, but by a very simple series of operations can be formed by direct synthesis from these.

Tauris. See TABRIZ.

Tauriscite (after *Pagus tauriscorum*, the Roman name for the Canton Uri, Switzerland, where it occurs), a mineral occurring in acicular crystals of the orthorhombic

system, and stated to have the physical characters and chemical composition of melanterite, which crystallizes in the monoclinic system.

Taurus, in astronomy, the Bull. The second of the zodiacal constellations. It is bounded on the E. by Gemini, on the W.

TAURUS.

by Aries, on the N. by Perseus and Auriga, and on the S. by Orion and Eridanus. It is composed of many small stars, but has a large one (Aldebaran) situated in the midst of a group called the Hyades. They constitute the Bull's forehead and eye. Another group falling within the limits of Taurus is that of the PLEIADES (*q. v.*). It is situated on the shoulder of the Bull. Taurus contains also the Crab cluster. Also the second sign of the zodiac (♉). The sun enters it about April 22.

Taurus, a mountain chain in Asiatic Turkey, stretching for about 500 miles from the Euphrates to the Ægean Sea, latterly running N. of the Gulf of Adalia. In the E. it takes the name of Ala Dagh, in the W. that of Bulghar Dagh. It descends steeply to the sea on the S.; N. it merges gradually into the plateau of Asia Minor. It is connected by the Alma-Dagh with the chain of Lebanon; and by Anti-Taurus, with Ararat, Elburz, and the Caucasus.

Taussig, Edward David, an American naval officer; born in St. Louis, Mo., Nov. 20, 1847; was graduated at the United States Naval Academy in 1867; commissioned ensign in 1868, master in 1870, and lieutenant-commander in 1892; served in various stations in Atlantic and Pacific waters, and in the coast survey; and was appointed commander of the "Bennington" in 1898. He took possession of Waku Island for the United States, was placed in charge of Anam on Feb. 1, 1899; and later, was assigned to duty in the Philippines and in China. He was promoted rear-admiral in 1908.

Tautog, the *Tautoga nigra,* common on the Atlantic coasts of temperate North America. It attains a size of from 12 to 14 pounds, and fetches a high price for the table. Called also the blackfish. It is, however, quite distinct from the European fish of that name. See BLACKFISH.

Tautology, the unnecessary repetition of the same thought in different words, as in such a sentence as "The two regiments *simultaneously* attacked the citidel *at the same time.*" If repetition of the thought is needful for greater lucidity or emphasis, it cannot be condemned as tautological; and there are certain phrases such as "to let and hinder," in which the tautology, originating in the epexegetic addition of the second word, is completely sanctioned by usage. Owing to the number of words whose composition and content are only to be distinctly discovered in the foreign language from which they are borrowed, English lends itself to the vice of tautology more readily perhaps than most other tongues.

Tautphœus, Baroness von (tout'fē-ös), an Irish novelist; born (Jemima Montgomery) in Ireland in 1807. She wrote the popular novels: "Cyrilla"; "Quits"; "At Odds"; "The Initials." She died in Munich Nov. 12, 1893.

Tavernier, Jean Baptiste (tä-ver-nyā'), **Baron d'Aubonne,** a French traveler; born in Paris, France, in 1605. He was the son of a Dutch merchant settled in Paris. Before his 21st year he had visited a considerable portion of Europe, and he repeatedly traveled through Turkey, Persia, India, and other Eastern countries, trading as a diamond merchant. In 1669, having realized a large fortune, and obtained a patent of nobility from the French king, he retired to his estate of Aubonne, in the Genevese territories. He compiled, with the aid of French littérateurs, "New Account of the Interior of the Sultan's Harem," "Six Journeys," and "Collection of Several Tales," which have been often reprinted and translated. He died in Moscow, Russia, in 1689.

Tavern Token, a token issued of old by a tavern keeper, and current only at his house. Grifford, however, suggests that a tavern token was simply an ordinary token, so called because "most of them would travel to the tavern."

Tavistock, a market town of Devon, England, 11 miles N. of Plymouth and 31 S. W. of Exeter; in a trough of the hills on the Tavy's left bank, with Dartmoor stretching away from it to the E. An old stannary town, till 1885 governed by a portreeve, it is the center of what not many

years ago was a great mining district. Two gateways, a porch, and the refectory are the chief remains of its once magnificent Benedictine abbey, founded in 961 by Ordgar, ealdorman of Devon, the father of the infamous Elfrida. It was rebuilt between 1285 and 1458; was the seat of a very early printing press; and had a revenue of $4,510 at the dissolution in 1539; when it was conferred on the first Lord Russell, remaining still with his descendant, the Duke of Bedford. The parish church (1318) is a fine structure, with a west tower (106 feet) resting on arches. Tavistock has also a guildhall (1848), corn market (1839), covered markets (1863), statues of the 7th Duke of Bedford by Stephens (1864) and Drake by Boehm (1883, a very fine one presented by the 9th Duke), and the Kelly College (1877), founded by Admiral B. M. Kelly. Drake and William Browne were natives, Pym and William Lord Russell members; and the Right Hon. W. H. Smith was educated at the grammar school. Pop. (1901) 4,728.

Tavoy, a district in the Tenasserim division of British Burma; area, 7,150 square miles; pop. 84,988. The country is mountainous with thick forests and jungle, and the chief rivers are the Tavoy and the Tenasserim. The chief town and the headquarters of the deputy-commissioner is Tavoy, about 30 miles from the mouth of the river of the same name; pop. 22,371. There is also an Island of Tavoy, the largest and most N. of the extensive chain which fronts the Tenasserim coast. It is about 18 miles long and 2 broad, and on the E. side there is a well-sheltered harbor called Port Owen.

Tawareks. See TUAREGS.

Tawing, See LEATHER.

Tax, a contribution imposed by authority on people to meet the expenses of government or other public services. (1) A government imposition, or charge made by the State on the income or property of individuals, or on products consumed by them. A tax is said to be direct when it is demanded from the very persons who it is intended or desired should pay it, as a poll tax, income tax, property tax, taxes for keeping dogs, etc. An indirect tax is one demanded from one person, who is expected and intended to recoup or indemnify himself at the expense of another, as customs and excise duties. (2) Any rate or sum imposed on individuals for municipal, county, or other local purposes, as police taxes, taxes for the repairs of roads, bridges, etc., poor tax, drainage tax, etc.

Tax applies to or implies whatever is paid by the people to the government, according to a certain estimate; the customs are a species of tax which are less specific than other taxes being regulated by custom rather than any definite law; the customs apply particularly to what was customarily given by merchants for the goods which they imported from abroad. The predominant idea in contribution is that of common consent; it supposes a degree of freedom in the agent which is incompatible with the exercise of authority expressed by the other terms, hence the term is with more propriety applied to those cases in which men voluntarily unite in giving toward any particular object; as charitable contributions, or contributions in support of a war; but it may be taken in the general sense of a forced payment, as in speaking of military contribution.

Also a disagreeable or burdensome duty or charge; an oppressive demand or exaction; a requisition; as, this is a heavy tax on his time and strength. See SINGLE TAX.

Taxaceæ, taxads; an order of Gymnogens. Trees or shrubs with continuous inarticulated branches, the wood with circular disks. Leaves evergreen, generally narrow, rigid, entire, veinless, alternate or distichous, sometimes dilated and lobed, in which case the veins are forked and of equal thickness. Flowers diœcious, naked, surrounded by imbricated bracts. Males having several stamens; filaments usually monadelphous. Female solitary, ovules naked, the foramen at the apex, the outer skin finally becoming hard. Pericarp imperfect, usually cup-shaped, succulent; embryo, dicotyledonous. Known genera 9, species 50.

Taxation, the act of imposing a tax or taxes on the subjects of a state or government, or on the members of a corporation or company by the proper authority, for the raising of revenue to meet the expenses of public services; the raising of revenue by means of taxes; the system by which such revenue is raised. Also a tax or assessment imposed; the aggregate of particular taxes. See SINGLE TAX.

Taxel, *Taxidea americana,* the American badger. The snout is shorter and more hairy than that of the European badger; the body of a whitish color, sometimes shaded with gray or tawny. Length, excluding the tail, about 24 inches, tail 6 inches. It abounds on the plains watered by the Missouri, but its S. range is not exactly defined. It appears to be more carnivorous than the European species.

Taxicornes, in entomology, the second family of Latreille's *Heteromera.* They are all winged; the body is for the most part square, with the thorax concealing or receiving the head; antennæ short, more or less perfoliate or grained; the legs adapted for walking. They live in fungi, beneath the bark of trees, or on the ground under stones. Tribes, Diaperles and Cassyphense.

Taxidea, in zoölogy, a genus of *Melinæ,* with one, or perhaps two species. *T. amer-*

icana is the common American badger of the United States. *T. berlandieri*, the Mexican badger, is possibly only a local variety.

Taxidermy, the name given to the art of putting up natural history specimens in the dried state. It includes the skinning and stuffing of fishes, reptiles, amphibians, birds, and mammals; insects and other invertebrata. But it does not properly comprise the making of wet zoölogical preparations which are to be preserved in spirits; nor, strictly speaking, does it include the articulating of skeletons, though this is usually treated of in books on taxidermy.

For the skinning of animals a few tools, such as scalpels, scissors, and forceps, are required. Incisions must be made in certain directions. Care has to be taken not to stretch the skin in detaching it from the body, and it is necessary to avoid soiling the plumage of birds or the hair and fur of mammals with blood or grease. The skull and certain wing and leg bones are left in their place to preserve as perfectly as possible the form of these parts in case of the skin being afterward mounted. Considerable difference of opinion has of late years arisen as to the best treatment for preserving or, as it is sometimes called, poisoning skins. Arsenical soap is still largely used. It commonly consists of arsenious acid 1 ounce, white soap 1 ounce, carbonate of potash 1 drachm, distilled water 6 drachms, and camphor 2 drachms. To preserve bird skins some prefer powdered white arsenic (arsenious acid) either alone or mixed with powdered alum; and nothing else is much used in the United States. But sometimes powdered oak bark and a little camphor are added, the proportions being arsenic 1 part, alum, 1 part, bark 2 parts, camphor ½ part. These powders should be applied to the inner surface of the skin when it is moist. A non-poisonous preservative soap of the following composition has been recommended: Chalk 2½ pounds, soft soap 1 pound, chloride of lime 2 ounces, tincture of musk 1 ounce. But as it is difficult to prevent a little free chlorine escaping from chloride of lime, there must be some risk of corroding or rotting skins by the use of this mixture. These dry powders should be well rubbed, and the soapy mixtures carefully brushed into the wet surface of skins. An alcoholic solution of corrosive sublimate is a good preservative for skins, but it is very poisonous. For cleaning feathers, and especially those that are light colored, powdered plaster of Paris is very effective. Wherever bird skins or the fur-covered skins of mammals are kept, camphor or naphthaline should be present. The latter is more obnoxious to destructive moths than the former, as it has a powerful and peculiar odor. Benzene is also very useful. Butterflies, moths, and other insects require to be kept in drawers or boxes of a peculiar construction to prevent the escape of the vapor of camphor or other preservative.

It would occupy too much of our space to describe in detail the process of stuffing or mounting an animal. Before the taxidermist can stuff or mount well he requires some training in anatomy and modeling, and a knowledge of the external forms of animals, as well as some acquaintance with their habits. He cannot be a master of the art unless he has the artistic faculty in a high degree. With rare exceptions, the remuneration hitherto obtained for stuffing animals has not been sufficient to secure the services of persons trained to produce high-class work. This explains why so many specimens in museums of natural history are so faulty and unattractive. That birds, mammals, and other animals can be made beautiful, instructive, and even of real service to science in the mounted state is, however, clearly seen in the work of the best taxidermists.

Taxin, in chemistry, a resinous substance extracted from the leaves of the yew tree by treatment with alcohol containing tartaric acid. It is slightly soluble in water, soluble in alcohol, ether, and dilute acids, and precipitated from acid solutions by alkalies in white bulky flocks.

Taxineæ, in botany, a tribe of *Coniferæ*, founded by Richard. Flowers diœcious; cones much reduced; scales small, thin, or coriaceous, the upper with one ovule. Seed hard, with a fleshy coat, or seated in a fleshy cup. Pollen globose.

Taxodium, a genus of plants, natural order *Coniferæ*. The *T. distichum*, or deciduous cypress, a common ornamental tree grown on lawns, is a native of North America. The bark exudes a resin which is used by the negroes for dressing wounds, and the roots which are hollow inside, are used for bee hives.

Taxocrinidæ, in palæontology, a family of *Crinoidea*. Basals three, very small; five subradial or parabasal pieces supporting three to seven circles of radials; Silurian to the Carboniferous.

Taxus, in botany, the yew, the typical genus of the order *Taxaceæ*. *T. Caccata*, the common yew, is an evergreen tree which often attains a great size. Specimens of remarkable antiquity are commonly seen in old churchyards. The timber is extremely durable and valuable, and was formerly much used for making bows. Its leaves and young branches act as narcotic-acrid poisons when eaten by man or the lower animals. *T. Canadensis*, the dwarf yew, or ground hemlock, is a small, evergreen shrub, with the general aspect of a dwarf hemlock spruce (*Pinus Canadensis*).

Tay, a river of Scotland, draining nearly the whole of Perthshire, and pouring into the German Ocean a greater bulk of water than any other British river; rises on Benloy, on the Argyllshire border, at an altitude of 2,980 feet. Thence it winds 118 miles E. N. E., S. S. E., and E.— for the last 25 miles as a tidal estuary, ½ mile to 3¼ miles broad, which separates Perth and Forfar shires from Fife. In the first 25 miles of its course it bears the names of Fillan and Dochart; it then traverses Loch Tay, and it afterward passes Aberfeldy, Dunkeld, Stanley, Perth, Dundee, and Broughty-Ferry. Its principal affluents are the Tunnel (58 miles long, and sometimes regarded as a N. head stream), Isla, Almond, and Earn. The Tay, as it is the most beautiful of Scottish rivers, so it is unrivaled for its salmon fisheries, whose rental in good years exceeds $100,000. Vessels of 100 tons can ascend as high as Perth, but even to Dundee the navigation of the firth is much impeded by shifting sandbanks.

Tay, Loch, a lake in Perthshire, Scotland, 355 feet above sea-level, and extending 14½ miles N. E. from Killin to Kenmore, ½ to 1½ miles broad, 15 to 100 fathoms deep, and covering 6,550 acres. It is a magnificent Highland lake, flanked on the N. W. by Ben Lawers (4,004 feet), and containing near its foot a wooded islet, with a fragment of an Augustinian priory, founded in 1122 by Alexander I., who here buried his queen, Sibylla. In September, 1842, Queen Victoria was rowed up Loch Tay, on which a steamer was first launched in 1883, and a railway to which, at Killin, was opened in 1886.

Tay Bridge, a great railway bridge in Scotland, crossing the estuary of the Tay from Fifeshire to Forfarshire at Dundee. The first bridge built here was opened for traffic in 1878. It was nearly 2 miles long, and had 84 spans, 13 of which were blown down during the passage of a passenger train in a violent storm Dec. 28, 1879. Instead of a repairing the bridge it was resolved to erect a new and more substantial one, and of the first all but the foundations has been removed. The present bridge is 2 miles 73 yards long, contains 85 piers, carries a double line of rails on a steel floor, and has an average height above high water, of 77 feet under four of the spans in the navigable channel. The piers are formed of cylinders embedded in the river bottom, and filled with concrete, while the superstructure is made of brick-work and malleable iron, braced by various stays and arches. The bridge was opened in June, 1887. See BRIDGE.

Taygetus, a part of a lofty ridge of mountains in Greece, which, traversing the whole of Laconia from the Arabian frontier, terminates in the sea at the promontory of Tænarus. Its outline, particularly as seen from the N., is of a more serrated form than the other Grecian mountains. In winter it is covered with snow, which renders the vicinity extremely cold. In summer it reflects a powerful heat upon the Spartan plain, from which it keeps the salubrious visits of the W. winds, and thus makes it one of the hottest places in Greece.

Taylor, Archibald Alexander Edward, an American clergyman; born in Springfield, O., Aug. 27, 1834; was graduated at Princeton College in 1854, and at the Princeton Theological Seminary in 1857; was ordained in the Presbyterian Church; held pastorates in Kentucky, Iowa, and Ohio in 1857–1873; was president of the University of Wooster, O., in 1873–1883; and dean and professor of its post-graduate department in 1884–1887. He became pastor of the Westminster Church, Columbus, O., in 1892. His publications include: "Claudia Procula and Other Verses" (1899), and many contributions to periodical literature.

Taylor, Bayard, an American writer and traveler; born in Kennett Square, Chester co., Pa., Jan. 11, 1825. He learned the trade of a printer; contributed to various magazines; made a journey through Europe on foot in 1844–1845; on his return published "Views Afoot in Europe," and in this way gained a position on the staff of the New York "Tribune." He afterward traveled extensively, giving his experiences in "Eldorado" (1850); "Central Africa" (1854); "The Lands of the Saracens" (1854); "Visit to India, China, and Japan" (1855); "Northern Travel" (1858); "Crete and Russia" (1859); "Byways of Europe" (1869); and "Egypt and Iceland" (1874). He also published several novels; various volumes of verse, such as "Rhymes of Travel" (1848); "A Book of Romances, Lyrics, and Songs" (1851); "Poems and Ballads" (1854); "Poems of the Orient" (1855); "The Masque of the Gods" (1872); and a translation of Goethe's "Faust" in the original meters. He resided in Germany for lengthened periods, was for some time United States secretary of legation at St. Petersburg, and latterly was United States minister to Germany. He died in Berlin Dec. 19, 1878.

BAYARD TAYLOR.

Taylor, Benjamin Franklin, an American author; born in Lowville, N. Y., July

Taylor

19, 1819. He was for several years connected with the Chicago "Evening Journal." He wrote: "Pictures of Life in Camp and Field" (1871); "The World on Wheels, etc." (1874); "Song of Yesterday" (1877); "Between the Gates" (1878); "Summer Savory, etc." (1879); "Dulce Domum" (1884); "Theophilus Trent," a novel (1887); etc. Among his best-known poems are: "Isle of the Long Ago," "Rhymes of the River," and "The Old Village Choir." He died in Cleveland, O., Feb. 24, 1887.

Taylor, Brook, an English mathematician; born in Edmonton, England, Aug. 18, 1685; was educated at Cambridge. Chosen a fellow of the Royal Society, he became its secretary in 1714, an office which he retained four years. His chief works are: "Direct and Inverse Method of Increments" (London, 1715), and "Linear Perspective" (London, 1715). He was discoverer of the mathematical formula called "Taylor's Theorem," of extensive application in the higher mathematics. He died in Somerset House Dec. 29, 1731.

Taylor, Charles Jay, an American artist; born in New York city Aug. 11, 1865; was graduated at the Law Department of Columbia College, and then studied art in New York, Paris, and London. Many of his works have been exhibited at the Academy of Fine Arts, Chicago, the Paris Salon, the Paris Exposition (1900); the Pan-American Exposition, Buffalo (1901); etc. His best-known illustrations are found in the following books: "The Tailor-Made Girl" (1884); "Short Sixes" (1894, H. C. Bunner); "Made in France" (1896, H. C. Bunner); "The Suburban Sage" (1897, H. C. Bunner); "The Four Hundred" (1897, C. J. Taylor); "Short Rations" (1898, Williston Fish); "Poems with Music" (1898, H. C. Bunner); etc.

Taylor, Frederich William, an American clergyman; born in Toledo, O., Jan. 11, 1853; was graduated at the Western Reserve College in 1873, and at the General Theological Seminary, New York city in 1876; ordained in the Protestant Episcopal Church in 1877; rector of Holy Trinity, Danville, Ill., in 1878-1886; called to St. Paul's Pro-Cathedral, Springfield, Ill., in 1886; became bishop of Quincy, Ill., in 1901; works: "The Confession of Our Christian Faith, commonly called the Creed of St. Athanasius" (1883), and reviews on "The Church of England During the Reign of King Edward VI." (1886); "St. Patrick, the Apostle of Ireland"; etc. He died April 27, 1903.

Taylor, George Boardman, an American clergyman; born in Richmond, Va., Dec. 27, 1832; was graduated at Richmond College and the University of Virginia; ordained in the Baptist Church; and served as pastor in Baltimore, Md., and Staunton, Va. In 1873 he was placed in charge of a Baptist mission in Italy. He was the author of "Oakland" (juvenile stories, 1859–1865); "Roger Bernard, the Pastor's Son"; "Coster Grew"; "Walter Ennis, a Tale of the Early Virginia Baptists" (1866–1870); "Baptists: Who They Are and What They Have Done" (4 vols. 1872–1873); "Italy and Italians" (1889); etc. Died in 1907.

Taylor, Sir Henry, an English writer; born near Durham, England, Oct. 18, 1800. At the age of 14 he entered the navy; afterward he became a clerk in the storekeeper-general's office; contributed to various periodicals, and undertook the editorship of the "London Magazine," but soon afterward accepted an appointment in the colonial office, where he remained for nearly 50 years. His contributions to literature are: "Isaac Comnenus," a tragedy (1827); "Philip van Artevelde," a dramatic romance (1834); "The Statesman," a series of essays (1836); "Edwin the Fair," historical drama (1842); "The Eve of the Conquest," and other poems (1845); "Notes from Life" (1847); "Notes from Books" (1849); "The Virgin Widow," a comedy, afterward named "A Sicilian Summer" (1850); and "St. Clement's Eve," a romantic drama (1862). He published an "Autobiography" in 1885. He died in Bournemouth March 27, 1886.

Taylor, Henry Clay, an American naval officer; born in Washington, D. C., March 4, 1845; appointed to the navy in 1860; promoted ensign in May, 1863, and attached to the "Shenandoah" in the North Atlantic Blockading Squadron, where he continued to serve till 1864, when he was assigned to special service in the steam sloop "Iroquois." Subsequently he served on various stations; in November, 1893, was appointed president of the Naval War College in Newport, R. I.; and on April 16, 1894, was promoted captain. Later he was made commander of the battleship "Indiana," in which capacity he took part in the destruction of Cervera's fleet. He became rear-admirable in 1901; chief of Bureau of Navigation in 1902. He died July 26, 1904.

Taylor, Horace A., an American financier; born in Norfolk, N. Y., May 24, 1831; moved to Wisconsin in 1847, and there engaged in newspaper work, banking and lumbering. He was United States consul to France in 1881–1884; a member of the Wisconsin Senate in 1888; United States railroad commissioner in 1889; and one of the commissioners in charge of the World's Columbian Exposition at Chicago, in 1893. He was appointed assistant secretary of the United States treasury in 1897.

Taylor, Isaac, known as TAYLOR OF ONGAR; an English minister and author; born

Taylor

in London, England, in 1759. He was originally an engraver. Besides sermons, he published many volumes, chiefly for the young; among which are: "Advice to the Teens"; "Beginnings of British Biography"; "Beginnings of European Biography"; "Biography of a Brown Loaf"; "Book of Martyrs for the Young"; "Bunyan Explained to a Child"; "Child's Life of Christ"; "Mirabilia; or, The Wonders of Nature and Art"; "Scenes in America, in Asia, in Europe, in Foreign Lands." He died in Ongar Dec. 11, 1829.

Taylor, Isaac, an English author, son of Isaac Taylor of Ongar; born in Lavenham, Suffolk, England, Aug. 17, 1787. Besides contributing to the "Eclectic Review," he published many books, including: "Elements of Thought" (1823); "History of the Transmission of Ancient Books to Modern times" (1827); "The process of Historical Proof Exemplified and Explained" (1828); "Natural History of Enthusiasm" (1829); "Physical Theory of Another Life" (1836); "Loyola and Jesuitism in its Rudiments" (1849). In 1862 a pension of $500 was bestowed on him from the civil service fund "in public acknowledgement of his eminent services to literature, especially in the departments of history and philosophy, during more than 40 years." He died in Ongar June 28, 1865.

Taylor, Isaac, an English clergyman and writer, grandson of Isaac Taylor of Ongar; born in Stanford Rivers, Essex, England, May 2, 1829, He was canon of York (1885), and wrote: "Words and Places," an explanation of the local names in Great Britain (1864); "The Family Pen: Memorials Biographical and Literary of the Taylor Family of Ongar" (1867); "The Alphabet: An Account of the Origin and Development of Letters" (1883); "The Manx Runes" (1886); "The Origin of the Aryans" (1890), summing up the evidence, especially that of philology and craniology, against the Central-Asian theory. "Origin of the Aryans and of Prehistoric Man" (in French, 1895); "Names and Their Histories" (1896); etc. Died Oct. 18, 1901.

Taylor, Baron Isidore Justin Séverin, a French dramatist; born in Brussels, Belgium, Aug. 15, 1789. Among his dramatic compositions are: "The Informer"; "Ismaïl and Marie." He wrote also "Picturesque Tour in Spain, Portugal, and the Coast of Africa" (3 vols. 1826–1832); "Syria, Egypt, Palestine, and Judea" (3 vols. 1835–1839); "Pilgrimage to Jerusalem" (1841); "The Pyrenees" (1843); and 24 volumes of "Picturesque and Romantic Travels in Ancient France" (1820–1863). He died in Paris Sept. 6, 1879.

Taylor, James Edward, an American artist; born in Cincinnati, O., Dec. 12, 1839; studied at the University of Notre Dame, South Bend, Ind. He early manifested a marked taste for drawing and painting; and just after finishing his education produced a panorama of the American Revolution. In 1860 he began the study of art in New York city; but when the Civil War broke out he entered the army with the 10th New York Regiment. During his spare time in the army he made numerous sketches of camp life. In 1863 he became artist and war correspondent for Frank Leslie. In 1867 he was sent as artist with the Peace Commission to the Indians and through his drawings of Indian life and manners became known as "The Indian Artist." He also accompanied President Grant's Commission to Santo Domingo. He retired from "Leslie's Illustrated Newspaper" in 1883, after which he devoted himself to painting in water colors and to making illustrations for magazines, confining himself largely to war subjects. One of his best known works is "The Last Grand Review," made for General Sherman. Four other paintings are in the Congressional Library in Washington, D. C. During his art career he acquired what was probably the largest collection in existence of portraits of army and navy officers in both the Union and Confederate services. He died in New York city June 22, 1901.

Taylor, Jeremy, "the modern Chrysostom"; born in Cambridge, England (baptized Aug. 15, 1613). He studied as a sizar at Caius College, and took his degree of M. A. in 1633. Shortly after he was admitted to holy orders, and his fine appearance and vivid eloquence soon attracted admiration. He won Laud's favor, and through the influence of that prelate was made a fellow of All Soul's College, Oxford. In 1638 he was appointed rector of Uppingham in Rutlandshire. In the civil war, Taylor, whose intellect was impregnably entrenched in reverence for ecclesiastical antiquity, naturally took the royal side, and so lost all his preferments. For many years he lived in retirement in Wales, busily engaged in writing books. In 1658 he went, on the invitation of the Earl of Conway, to Ireland. Immediately after the Restoration he was made Bishop of Down and Connor, which

JEREMY TAYLOR.

Taylor

see, as also that of Dromore, he held till his death at Lisburne Aug. 13, 1667. Taylor's writings may be classified as practical, theological, casuistic, and devotional. Under the first head we have a "Life of Christ" (1649), which deals with the main incidents of the gospel narrative, and steers clear of theological discussions; "Holy Living" (1650) and "Holy Dying" (1651), and "Sermons" (1651–1653). To the second class belong his "Episcopacy Asserted" (1642) a temperate and reasoned defense of the principles of his Church, with which may be classed his "Apology for Authorized and Set Forms of Liturgy," "The Liberty of Prophesying" (1648), a plea for toleration and mutual charity among all Christian sects, "The Doctrine of Repentance, or Unum Necessarium" (1655), a work condemned by his brethren for its arguments as to the nature of sin, and "Dissuasion from Popery" (1647). His chief casuistic work is his "Ductor Dubitantium" (1660), an elaborate and somewhat wearisome discussion of very many points in Christian ethics, while his best devotional work is his "Golden Grove" (1655), so called after the mansion of his Welsh patron and friend, the Earl of Carberry.

His writings are distinguished in their best parts by a sweet, rich, and solemn eloquence, an artless grace of style, and a heavenly serenity of spirit. His wealth of illustration is absolutely without limit. Simile after simile springs from his teeming fancy till the primary thought is almost lost amid an Oriental splendor of imagery. Emerson calls him the "Shakespeare of divines." If we have regard only to the exuberance of his genius, the phrase is not hyperbolical. His learning was vast and curious, and it is frequently introduced in the happiest and quaintest manner to illustrate the subject under discussion. The study of scholastic philosophy has not been without its bad effects on him. Frigid conceits and far-fetched allusions occasionally mar his writings. Personally he was a man of a truly Christian disposition and of such a noble charity that he stands out in gracious contrast to most of his contemporaries. His sentiments on toleration (like those of Milton) lift him immeasureably above his age and his party, and entitle him to be held in perpetual honor by all who think it a crime to punish freedom of thought.

Taylor, John, styled by himself "The King's Majesty's Water-Poet"; born in Gloucester, England, in August, 1580. After serving in 16 voyages, having been with Essex at Cadiz and the Azores, he began to ply as a waterman on the Thames, at the same time keeping a public house, and soon became known as a humorist and a writer of doggerel verses which he hawked about for sale. He was chiefly distinguished by the performance of several fantastic feats of rowing, which are celebrated in his "Travels in Germanie; or Three Weeks, Three Daies, and Three Hours' Observations and Travel from London to Hamburg" (1617), and "The Praise of Hempseed, with the Voyage of Mr. Roger Bird and the Writer hereof, in a Boat of Brown Paper, from London to Quinborough in Kent" (1623). The memorable incident in his life, however, was his traveling on foot from London to Edinburgh, "not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging." He set out on July 14, 1618, and reached Edinburgh on Aug. 13. This journey was believed by Ben Jonson to have been undertaken "in malice or mockage" of him on account of his similar journey shortly before; yet, meeting him at Leith, Jonson presented Taylor with "a piece of gold of two-and-twenty shillings to drink his health in England." Taylor's journey is narrated in his "Penniless Pilgrimage, or the Moneyless Perambulation of J. T., alias the King's Majesty's Water-Poet, from London to Edenborough on Foot" (1618). In 1630 Taylor published "All the Works of J. T., being Sixty and Three in Number," but before his death in 1654 he had produced 138 separate publications. A complete edition of his works was undertaken by the Spenser Society in 1867.

Taylor, John, an English theologian; born in Lancashire in 1694; was educated at Whitehaven; and obtained his degree from a Scotch university. He was pastor for many years of a Norwich Unitarian congregation, but in 1757 became tutor in the academy of Warrington. He was author of "The Scripture Doctrine of Original Sin" (1738); "The Scripture Doctrine of the Atonement" (1750); a "Hebrew Concordance to the English Bible" (1754); "Scheme of Scripture Divinity" (1762) etc. These writings once excited considerable interest. The somewhat Socinian theology of Robert Burns' youth was confessedly influenced by them. He died March 5, 1761.

Taylor, John, an American Mormon; born in Winthrop, Westmoreland, England, Nov. 1, 1808; went to Toronto, Canada, in 1832, and was there converted to Mormonism by the preaching of Parley Pratt in 1836. In 1838 he was made an "apostle" and settled in Missouri. For 10 years he preached his faith in France and England, but returned to the United States in 1852 and took an active part in Mormon affairs. He was with Joseph Smith when the latter was killed, and was himself shot four times. When Utah applied for admission to the Union he represented that territory in Congress, and on the death of Brigham Young was elected president of the Mormon Church. In 1885 he was indicted for polyg-

Taylor

amy, and in order to avoid arrest was forced to exile himself. He died July 25, 1887.

Taylor, John Louis, an American jurist; born in London, England, March 1, 1769; came to the United States in 1781; was educated at William and Mary College; and removed to Fayetteville, N. C., where he was admitted to the bar. He was a member of the Legislature in 1792–1794; removed to Berne in 1795; elected judge of the Superior Court in 1798; and became chief justice in 1808. In 1817 he was appointed a commissioner to revise the statute laws of North Carolina; and in 1818 one of the judges of the newly-established court, where he served till his death. His publications include "Cases in the Superior Courts of Law and Equity of the State of North Carolina" (1802); "The North Carolina Law Repository"; "Charge to the Grand Jury of Edgecombe, exhibiting a view of the Criminal Law" (1817); "Term Reports" (1818); and a treatise "On the Duties of Executors and Administrators" (1825). He died in Raleigh, N. C., Jan. 29, 1829.

Taylor, Marshall William, an American clergyman; born in Louisville, Ky., July 1, 1846, of Scotch-Irish and Indian descent on his father's side, and of African or Arabian stock on his mother's side; became a teacher in Hardinsburg, Ky., under the Freedman's Bureau in 1867; entered the ministry of the Methodist Episcopal Church in Kentucky in 1870; preached in Kentucky, Indiana, and Ohio; was fraternal messenger of the Methodist Episcopal Church to the African Methodist Episcopal Church in 1880; delegate to the Ecumenical Methodist Conference in London, England, in 1881; and was elected editor of the "Southwestern Christian Advocate" in 1884. He died in Louisville, Ky., Sept. 11, 1887.

Taylor, Nathaniel William, an American clergyman; born in New Milford, Conn., June 23, 1786; studied at Yale; became pastor of a Congregational church at New Haven in 1812; and Professor of Theology in Yale College in 1822. In numerous sermons, lectures, and essays he maintained what from his pastoral charge became known as the "New Haven theology," long assailed as heretical. This system, a softening of the traditional Calvinism of New England, maintained the doctrine of natural ability, and denied total depravity; sin is a voluntary action of the sinner; but there is, derived from Adam, a bias or tendency to sin, which is not itself sinful. His works were edited in five volumes by his son-in-law, Dr. Noah Porter (1858-1859). He died in New Haven, Conn., March 10, 1858.

Taylor, Philip Meadows, an English administrator; born in Liverpool, England, in 1808. From being a merchant's clerk in Bombay he entered the Nizam's army; received an appointment as administrator of the State of Shorapur, maintained order in the Berar district during the mutiny of 1857; and received the rank of colonel, a companionship of the Star of India, and a commissionership of the Western Deccan districts. He published the "Confessions of a Thug" (1839); "Tippoo Sultaun" (1840); "Tara" (1863); "Ralph Darnell" (1865); "Manual of the History of India" (1870); and "A Noble Queen" (1878). He died in 1876.

Taylor, Richard, an American military officer; born in New Orleans, La., Jan. 27, 1826; was graduated at Yale College in 1845; and entered the Mexican War with his father, Zachary Taylor. In 1861 he became colonel in the Confederate army and took part in the Battle of Bull Run. He was made a Brigadier-General in October, 1861; served under "Stonewall" Jackson in Virginia; was promoted Major-General; and in 1863–1864 served in the Trans-Mississippi Department opposing Banks in his Red River expedition. With part of his command he captured Brashear City, June 24, 1863, with a large amount of public property and the small arms of 4,000 National troops. His attempt on Algiers preliminary to proposed operations against New Orleans was frustrated by the presence of Farragut's vessels, and when Banks's forces were released by the surrender of Port Hudson, July 9, they proceeded to expel Taylor and his command from the country E. of the Atchafalaya. He was forced to withdraw and made no further attempt to gain a foothold on the Mississippi. Afterward he was in command at Mobile and surrendered that city to General Canby in 1865. He died in New York city April 12, 1879.

Taylor, Rowland, a Marian martyr; was a native of Rothbury in Northumberland, England, and studied at Cambridge, taking his LL. B. in 1530 and LL. D. in 1534. Cranmer, to whom he was domestic chaplain, gave him the rectory of Hadleigh in Suffolk (1544), and he subsequently became archdeacon of Exeter (1551) and a canon of Rochester. Under Mary he was imprisoned as a heretic for more than a year in the King's Bench, and on Feb. 8, 1555, was burned near Hadleigh.

Taylor, Thomas, styled THE PLATONIST, an English author; born in London, England, May 15, 1758. His works comprise 63 volumes, of which 23 are large quartos. Among them are treatises on arithmetic and geometry; on the Eleusinian and Bacchic mysteries; an essay on the "Rights of Brutes," in ridicule of Thomas Paine's "Rights of Man"; a "History of the Restoration of the Platonic Theology";

and a volume of "Miscellanies in Prose and Verse." His main labor was the translating of great classical Greek and Latin works. His translation of Plato was in five volumes, and was printed at the expense of the Duke of Norfolk. Of his translation of Aristotle only 50 complete copies were struck off, the expense being defrayed by W. Meredith, a retired tradesman. He died in London Nov. 1, 1835.

Taylor, Thomas, an American scientist; born in Perth, Scotland, April 22, 1820; was educated at the Andersonian University in Glasgow, Scotland, and later pursued special studies in electricity, chemistry, etc. He invented the first inter-leaved electrical condenser in 1841; a pneumatic battery for igniting explosives in 1850; a safety lamp for coal miners; and in 1851. came to the United States and demonstrated that electricity could be transmitted across the sea without wires. He became connected with the Ordnance Department of the army, where he invented and improved rifle projectiles. He studied and became a specialist on fungoid diseases of plants; and was associated with various chemical, biological, and medical societies and institutions. He was the author of "Students' Handbook of Mushrooms of America"; "The Diseases of Plants"; "The Silver Nitrate Test for Oils"; "Causes of Bursting of Heavy Ordnance"; etc.

Taylor, Tom, an English dramatist; born in Sunderland, in 1817. He received his education at Glasgow University and Trinity College, Cambridge; became professor for two years in University College, London; was called to the bar (1845), and went to the N. circuit; appointed, in 1854, secretary to the Board of Health; wrote and adapted for the stage a great number of plays; and succeeded Shirley Brooks (1873) as editor of "Punch." The most popular of his plays are: "New Men and Old Acres"; "Masks and Faces" (in collaboration with Charles Reade); "Still Water Runs Deep"; "The Overland Route"; and "The Ticket of Leave Man." His historical dramas include: "The Fool's Revenge"; "Joan of Arc"; "'Twixt Axe and Crown": "Lady Clancarty"; "Anne Boleyn"; etc. He also published biographies of B. R. Haydon (1853), C. R. Leslie (1859), and Sir Joshua Reynolds (1865). He died in Wandsworth, England, July 12, 1880.

Taylor, William, an English author; born in Norwich in 1765. He was educated for a mercantile career, but after a lengthened stay in Germany he resolved to devote himself to literature. His published works are: a translation of Bürger's "Lenore" (1796) and Lessing's "Nathan the Wise" (1805); "English Synonyms Discriminated" (1813); and a "Historic Survey of German Poetry" (1828). He died in 1836.

Taylor, William, an American clergyman; born in Rockbridge co., Va., May 2, 1821; was a member of the Baltimore Conference in 1843; held a number of charges; and in 1849 was sent by the Missionary Society of the Methodist Episcopal Church to San Francisco where he labored till 1856, when he started on an evangelistic tour through Canada and the Eastern States. In 1862 he went abroad to continue his work in England and Ireland; later he traveled over Europe and in Egypt and the Holy Land; conducted missionary services in Australia, Tasmania, and New Zealand; and made a tour of the missions of the West Indies and British Guiana. In 1872 he started the self-supporting missions in Bombay, and later engaged in similar work in Africa, of which he was made missionary bishop in 1884. He published "Seven Years' Street Preaching in San Francisco" (1856); "Addresses to Young America, and a Word to the Old Folks" (1857); "California Life Illustrated" (1858); "The Model Preacher" (1860); "Reconciliation, or How to be Saved" (1867); "Infancy and Manhood of Christian Life" (1867); "Four Years' Campaign in India" (1875); "Pauline Methods of Missionary Work" (1889); etc. At the general conference of the Methodist Episcopal Church in Cleveland, O., in May, 1896, he was declared non-effective and relieved of his charge. He died May 18, 1902.

Taylor, William Bower, an American physicist; born in Philadelphia, Pa., May 23, 1821; was graduated at the University of Pennsylvania in 1840; admitted to the Philadelphia bar in 1844; and later studied civil engineering. He was examiner in the United States patent office in 1854–1877; and editor of the publications of the Smithsonian Institution after 1878. He published "Thoughts on the Nature and Origin of Force" (1870); "On the Refraction of Sound" (1875); "Kinetic Theories of Gravitation" (1876); "Recent Researches in Sound" (1876); "History of the Electromagnetic Telegraph" (1878); "The Scientific Work of Joseph Henry" (1878); "Physics and Occult Qualities" (1882); etc.

Taylor, William George Langworthy, an American educator; born in New York city May 13, 1859; was graduated at Harvard University in 1880, and at its Law Department in 1883. He spent four years pursuing special studies in Europe; and in 1893 was made Professor of Economics at the University of Nebraska. His publications include "Exercises in Economics" (1890), and several contributions to the reviews on economic subjects.

Taylor, Zachary, an American statesman, 12th President of the United States; born in Orange co., Va., Sept. 24, 1785. He was the son of a Virginia colonel, who served in the Revolutionary War. The family removed to Kentucky in 1785. In 1808 he was appointed a lieutenant of infantry, and in 1810 promoted to captain. In 1812 he was appointed to the command of Fort Harrison, near the present city of Terra Haute, Ind., which he defended with his troops from the attack of a large force of Indians, for which he was brevetted major. He served in the Black Hawk War of 1832, and in 1837 was given full command in Florida, where he defeated the Indians in the battle of Okechobee, thereby putting an end to the Indian War. In 1840 he was given command in the Southwest. When Texas was annexed, he marched to Corpus Christi. In 1846 he was ordered to the Rio Grande, the Mexican invasion having been already planned. He established a camp opposite Matamoras. The Mexicans claimed that the Neuces was the actual

ZACHARY TAYLOR.

Texas boundary, and the Mexican commander ordered Taylor to withdraw. Acting under orders from his government, he refused. Fearing his base of supplies at Point Isabel would be cut off, Taylor marched for that place. On the way he was attacked, and won the two victories of Palo Alto and Resaca de la Palma, on two successive days. Having been ordered to send his best troops to reinforce General Scott, he won the victory of Buena Vista, nevertheless, in 1847, with a force much inferior to the enemy's. In 1848 he was nominated by the Whig Convention for the presidency, and was elected. Inaugurated on March 4, 1849, he died in Washington, D. C., July 9, 1850. On account of his promptness and abrupt manner he was called "Old Rough and Ready."

Taylor, Fort, a fortification of Key West, Fla.; commanding the N. entrance to the Gulf of Mexico.

Taylorite (after J. W. Taylor, who analyzed it); a mineral found in small concretions having crystalline structure, in the guano beds of the Chincha Islands; hardness, 2.0; color, yellowish-white; taste, pungent and bitter; Composition: Sulphuric acid, 47.8; potash, 47.0; ammonia, 5.2 = 100, which is equivalent to the formula $(\frac{5}{6}\,KO + \frac{1}{6}\,NH_4O)\,SO_3$.

Taylor University, a coeducational institution in Upland, Ind.; opened in 1846 under the auspices of the Methodist Episcopal Church; has grounds and buildings valued at over $46,000; scientific apparatus, etc., $2,000; volumes in the library, about 6,000; ordinary income, $16,000; average number of faculty, 22; average student attendance, 210.

Tayra, in zoölogy, the *Galera barbara,* a small carnivorous mammal, about the size of a marten, from tropical America. Its color is uniform black, slightly tinged with brown, with a white patch on the throat and upper part of the chest. In a wild state it burrows in the ground; it is easily tamed, and becomes a lively and amusing pet in captivity.

Tchad, Chad, or **Tsad, Lake,** a large fresh-water lake of Central Africa, in the Sudan, having the territories of Bornu, Kanem, and Bagirmi surrounding it; length, about 150 miles; breadth, about 100 miles; area, about 20,000 square miles, with a variable expanse according as it is the wet or dry season. Its principal feeder is the Shari from the S., and its shores are low and marshy. The lake (which has no outlet) swarms with turtles, fish, crocodiles, and hippopotami. It contains a number of small islands, which are densely peopled, as are also great part of its shores, especially in the W., where is the large town Kuka, capital of Bornu.

Tchang-Kooe. See MIDDLE KINGDOM.

Tchernaieff, Michael Gregorovich, a Russian military officer; born in Russia in 1828; was educated for the army in the Staff College at Nikolaieff, Russia; served through the Crimean War; and in 1858 was intrusted with the command of an expedition against the Kirghiz tribes on Lake Aral, in which he was instrumental in the extension of Russian dominion over all that part of Asia. Retiring from active service in 1874, he became a leader in the Pan-slavist movement, and by the articles in his journal, "Russki," stirred up the agitation that led to the Russo-Turkish War. In 1879 he went to Rumelia to stir up a Bulgarian insurrection, but was arrested and sent back to Russia, where in

1882 he was appointed governor-general of Turkestan and commander of the district of Tashkend. He was recalled in 1884 and appointed a member of the Council of War, but lost his seat two years later through his opposition to General Annenkoff and the Trans-Caspian railroad project. He died in Mohileff, Russia, Aug. 17, 1898.

Tchernaya (cher'nī-ä), a river in the Crimea. On Aug. 16, 1855, the lines of the allied army at this place were attacked by 50,000 Russians under Prince Gortchakoff, who was repulsed with the loss of 3,329 slain, 1,658 wounded, and 600 prisoners. The brunt of the attack was borne by two French regiments under General D'Herbillon. The loss of the allies was about 1,200; 200 of these were from the Sardinian contingent, which behaved with great gallantry, under the command of General La Marmora. The Russian General Read, and the Sardinian General Montevecchio, were killed. The object of the attack was the relief of Sebastopol, then closely besieged by the English and French. It was, in fact, one of a series of desperate battles during the siege. See SEBASTOPOL.

Tchernozem, the name for a black soil in Russia of extraordinary fertility, covering at least 100,000,000 acres, from the Carpathians to the Ural Mountains, to the depth of from 4 to 20 feet, and yielding an almost unlimited succession of similar crops without preparation.

Tchernytchevskii, Nikolai Gavrilovich, (cher-nē-chev'skē), a Russian writer; born in Saratov July 1, 1828. He translated into Russian J. S. Mill's "Principles of Political Economy," making considerable additions to the first volume. While in prison as a suspect he wrote the novel "What's to be Done?" (1863), which won for him deportation to Siberia. It has been translated into English. In 1883 he was allowed to live in Astrakhan, and was pardoned in 1889. He died in Saratov Oct. 29, 1889.

Tchudi, a name given by the Russians to the Finnic races in the N. W. of Russia. It is now more generally applied to designate the group of peoples of which the Finns, the Esthonians, the Livonians, and the Laplanders are members.

Tea, the dried leaf of an evergreen shrub of the natural order *Ternstrœmiaceæ*, for which the Linnæan botanical name of *Thea Chinensis* is generally current, though the genus *Thea* is by recent systematists merged in *Camellia*, and the plant is now called *C. Thea* of Link. It includes *C. Bohea*, the China plant, and *C. Theifera*, the indigenous Assam plant. At one time it was supposed that two Chinese species were grown of which *T. Bohea* furnished the black tea and *T. viridis* the green tea of commerce, but further research has shown that these species cannot be maintained. The tea plant may be described as a glabrous or slightly pubescent shrub with elliptic-oblong, acuminate leaves; flowers solitary, on short 2–3 bracteate stalks, with five rotundate, very obtuse, persistent sepals, and white, obovate, obtuse petals; stamens many with versatile anthers, the inner five free; ovary 3-celled villous; styles 3, glabrous; capsule woody, smooth, splitting at maturity into three valves; seeds large, oily, with a hard, smooth, shining testa. Though the varieties are numerous, it is not at present possible to distinguish them within definite or yet [illegible] plant is marked by more acuminate and more membranous leaves, is also stronger in taste, but far more susceptible to drought and frost than the China plant. Whether the tea shrub is indigenous in China and Japan is a doubtful question; so far as can be judged, pending the thorough botanical explorations of these countries, it appears to have been imported thither from Assam and Cachar, and possibly also from Siam and Cochin. The fact has been historically established that the culture of tea existed in China in the 4th century, and in Japan in the 9th century, and from these countries it was exclusively obtained for any other part of the globe till the time of the present generation. The import appears to have reached Europe during the early part of the 17th century, but we do not hear of any substantial arrival in England till 1657, and for a long time the high price kept its use limited to the wealthy class. At the present day it is estimated that half the human race uses tea habitually or occasionally.

The discovery of the indigenous plant in the forest country of Upper Assam was made in 1834, and since 1840 its cultivation there has taken very firm root, as also in Cachar, Sikkim, the Northwestern Himalaya, and other parts of India. The spread of tea field cultivation in Northwestern India is mainly due to the late Dr. W. Jameson, who established government plantations in Dhera Dhoon, Kumaon, Gurhwal, and Kangra. Since then private individuals and companies have taken part in extending its cultivation in these districts, the government still, however, continuing to foster its growth, not with a view to immediate pecuniary profit, but simply to encourage so important an article of commerce. In one year they contributed to private planters upward of 130 tons of seed, and 2,400,000 seedlings. In the Neilgherries also, the introduction of tea culture has proved a success, and there can be no doubt that the cultivation will still spread in India, land ranging over a district exceeding 1,000 miles in length being more or less adapted

Tea

to its growth. The production in Assam spread with almost unexampled rapidity. Tea was introduced into Java as an agricultural plant about 1835; into Carolina about 1845; into Brazil in 1860.

A damp, warm climate, with rains to the extent of 70 or even 100 inches, well spread over the year, and copious in spring, is above all adapted for tea culture. Rich forest land in its virgin state is preferable to any other. Wide valleys with gentle slopes or undulations, or slightly-elevated level lands with natural drainage, are more eligible than steep hillsides. Light loams of a re[illegible]llowish color crumbling throughout, of several feet in depth, with a surface stratum of decomposed forest foliage, is insisted on as the most desirable for the largest and most lasting yields. Low

TEA-PLANT, FRUIT AND FLOWER.

lands with any stagnant humidity are not fit for use till drained. The plants must be kept in vigorous growth by the suppression of weeds, periodical turning of the soil, judicious pruning, and adequate manuring. In India an elevation of 4,500 feet down to 2,000 feet is best. The number of tea plants per acre varies from 1,860 to 2,700 according as they are placed five feet or four feet apart. The yield per acre after the fourth or fifth year is approximately 240 pounds in India and 320 pounds in Assam. Picking and manufacture extend from April to October, during which period 20 pickings are calculated on. Growers in India adopt a less complicated system of manufacture than that practised in China, as detailed by Mr. Fortune in his "Tea Countries of China." The Indian plan for black tea may be briefly described.

The operation of plucking is simply the removal from the bush by the finger and thumb of the young shoots with three or four leaves; the amount of the gathering by a laborer per day depending on the weather, the season of the year, the health of the bushes, and the quality of leaf wanted. The produce, after being weighed, is laid in a cool place, and the following day is spread out thinly on mats in the sun, whereby the leaf becomes sufficiently flaccid for rolling without much breakage. The rolling is slow and laborious handwork, performed on a common deal table, and unless conducted with uniformity, the next process of fermentation will also be irregular. The fermentation is effected by thoroughly shaking up the leaf, throwing it loosely into a heap ,and covering closely with mats or carpets — the length of time required depending on the quality and state of the weather. Then succeeds firing in metal pans at a temperature of 240° or 250°. After a few minutes of this treatment it is brushed out, thrown on a table, and again quickly rolled while hot. The same process of firing and rolling is repeated, and finally the leaf is exposed to the sun, or placed over charcoal fires to dry. Some planters send their tea to market as soon as manufactured; others store it till the close of the tea-making season, and by picking and sifting classify their harvest. The tea is generally packed in strong light chests and half-chests, containing 80 pounds and 40 pounds. For making green tea the series of operations are somewhat different to the above, the firing being for a longer period and at a higher temperature, and instead of fermentation a little sweating only is permitted. Well-made green tea for bulk is nearly twice as heavy as black.

The youngest and therefore smallest leaves produce the most delicate flavored tea. In ordinary commerce four kinds of black and six of green tea are recognized, but the difference between them consists chiefly in size. In the first, Congou forms the bulk of the British import, Pekoe and Souchong being finer and dearer kinds, and Bohea coarser; and in the green the various Hysons and Gunpowder are most familiar. Hlassa brick tea is pressed in the form of a brick, and is prepared when used with butter and salt. It is preferred to all other teas by the natives of Central Asia and Tibet.

An infusion of tea as a beverage has trifling actual nutritive value, but it increases respiratory action and stimulates greater activity of the brain; its effect on the nervous system being due to the essential oil and the theine, while the 14 per cent. of tannin it contains is an astringent.

Substitutes for tea have been found in a number of plants, some of which contain the same stimulating property, such as maté, guarana, cola nut, and coffee leaves. Others have been selected by our early colonists, etc., for infusion, and the cognomen tea has in consequence been given to the plants. Thus we have Australian tea for several species of *Leptospermum* and *Melaleuca*, Labrador tea is *Ledum latifolium*, Mountain tea is *Gaultheria procumbens*, New Jersey tea is *Ceanothus Americanus*, New Zealand tea is *Leptospermum scoparium*, Oswego tea is *Monarda didyma*, Botany Bay tea is *Smilax glycyphylla*, and West Indian tea is *Capraria biflora*.

Tea Cultivation in the United States. The following summary of tea cultivation in the United States up to that date is from the official report of James Wilson, Secretary of the United States Department of Agriculture, for the year ending June 30, 1900:

For several years prior to 1900 Dr. Charles U. Shepard, of Summerville, S. C., had been experimenting with a view of obtaining information as to the practicability of producing American tea. His experiments seemed so likely to produce valuable results, that the United States Department of Agriculture in 1900 made arrangements for furnishing him with machinery, etc., for settling some questions pertaining to the commercial production of tea. Dr. Shepard utilized the labor of colored children, establishing schools on his place, in which the children were received and educated, being at the same time taught to pluck tea and perform other work in connection with the production of the crop, for which fair wages were paid. Secretary Wilson goes on to say:

"The experiments so far conducted have shown that tea may be produced in the United States in two ways: (1) By families in their gardens, as was demonstrated years ago to be entirely feasible; and, (2) on a commercial scale, after the manner followed by the British East Indian tea establishments and the beet-sugar industry.

"The work at Summerville was started with a view of ascertaining whether under favorable conditions tea plantations could be made to yield as much as the average Oriental production, and whether the crop could be marketed at a fair profit. The results obtained have been affirmative, the crop of 1900, though not so large as expected early in the season, exceeding that of any previous year by at least 12 per cent., and the entire product being sold before it was all gathered to a prominent Northern distributing house at a price that gave a fair profit.

"As further evidence that tea can be profitably grown in the United States, capitalists are already making preparations to begin the work in certain parts of the South on a more or less extensive scale. A company with a capital of $50,000 is being organized, and will endeavor to secure a location having soil and climatic conditions adapted to the growth of tea, and where labor, such as Dr. Shepard utilizes, can be secured.

"From what has already been accomplished, it has been shown that a good grade of tea can be grown and put on the market in bulk at a cost not exceeding 15 cents per pound. Under average conditions an acre will yield 400 pounds of marketable tea, and this, at 15 cents per pound, would make the expense of growing it $60 per acre. The tea should sell in bulk for at least 30 cents per pound, and the profit on this basis would be 100 per cent. Besides the cost of marketing, however, there are other expenses to be considered, namely, the salary of a superintendent and the interest of the money invested in the plant, which would, of course, cut down the profits.

"In the future special attention will be given to the manufacture of pure green tea. This subject is now claiming the attention of both inventors and planters in the British colonies, as they begin to realize the hopelessness of bringing American tea drinkers to use the black tea instead of the green. The manufacture of green tea in the United States can be made successful only by the invention of machinery which shall take the place of expensive hand labor and prevent the waste which accompanies the latter. These questions are all being investigated by the Department and, in addition, it is giving special attention to a study of the conditions in various parts of the South with reference to determining the localities where tea can be grown to best advantage. Experiments have been inaugurated by some of the experiment stations and plants distributed with a view of putting the work on a substantial basis."

Teak, *Tectona grandis*, one of the most valuable timbers known; the wood of a large deciduous tree (natural order *Verbenaceæ*) with leaves from 10 to 20 inches in length, and from 8 to 15 inches in breadth. The tree, which has small white flowers in panicles, is found in Central and Southern India, where, however, it is now scarce in some localities in which it was formerly plentiful. There are extensive forests of it in Burma and Siam, and it extends into Java and some neighboring islands. In India growing teak is placed under the management of a conservator of forests, and very little is now exported from that country. The wood is of a quiet yellow color, tending to brown, and like many other kinds of timber has a characteristic odor. It is classed as a hardwood, though it is only of medium hardness, taking, however, a good polish; and it is straight grained and strong. Though easily worked when not long cut down, it readily blunts tools after being kept some length of time. Its average sp. gr. when dry is about 585.

Teak does not shrink much in seasoning, and it is believed to expand and contract less by differences of temperature than most woods. Unless very thoroughly seasoned it has some tendency to split, and this is perhaps its chief defect. It is much less resinous than some other well-known hardwoods, such as mahogany and rosewood, but it is usually said to contain an aromatic

essential oil which prevents iron in contact with it from becoming rusted, and for this reason it is always used for the backing to the armor plates of ships of war. A sticky elastic extract, to some extent resembling india-rubber, is obtained from teak by treating the wood with naphtha or ether. It is probably this which is the real cause of the wood preventing iron from rusting.

The pores of the wood are sometimes filled with a white substance, which has been ascertained to be phosphate of lime (calcium phosphate). There is a high percentage both of this substance and of silica in the ash of teak, and this no doubt explains why carpenters and other tradesmen consider it gritty. White ants rarely attack the wood if it is sound, but nevertheless logs of it are often badly worm-eaten; these, however, are rarely sent to Europe, and are believed to be derived from unhealthy trees. Teak wood varies considerably in quality even when perfectly sound.

In India teak is used for all kinds of work where strength and durability are required, such as for building ships, houses, and bridges, also for the construction of railway carriages and furniture. In England it is largely employed in shipbuilding, and to some extent for architectural purposes, such as shop fronts as well as for furniture. It has numerous minor applications. The leaves of the tree yield a red dye. Being of large size they are used in India for plates and for thatching. The great increase in the consumption of teak in recent years shows that the wood is much appreciated for its valuable properties.

African teak (*Oldfieldia Africana*) is imported from the W. coast of Africa; it is also a valuable timber, but less so than true teak.

Teal, a popular name for any individual of the genus *Querquedula*. They are the smallest of the ducks, and widely distributed over the world, generally frequenting rivers and lakes, and feeding, principally at night, on aquatic insects, worms, small mollusks and vegetable matter. The common teal, *Q. crecca*, is plentiful in most parts of Europe; length is about 14 inches, head of male brownish-red, the body transversely undulated with dusky lines, white line above and another below the eye, speculum black and green. It nests on the margins of lakes or rivers, collecting a mass of vegetable matter, lining it with down, and laying 8 or 10 eggs. The flesh is extremely delicate, and the bird might be advantageously introduced into the poultry yard. *Q. circia* is the garganey, or summer teal; *Q. carolinensis*, the green-winged teal, of the United States, closely resembles the common teal, but has a white crescent in front of the bend of the wings; *Q. discors*, with the same habitat, is the blue-winged teal. *Aix galericulata*, the Mandarin duck, is sometimes called the Chinese teal.

COMMON TEAL: MALE AND FEMALE.

Tears, usually pure water, with saline traces; but in cases of poisoning may show the poison, and in diabetes become saccharine like the other secretions. Serving normally to moisten eyeballs, interior eyelids, and nose, they are regularly secreted in normal quantities, and disappear by the duct into the nose. Where there is spasmodic contraction of the muscles about the eye, as in fits of coughing, yawning, or immoderate laughter, the tears are squeezed out from the eyelids and run down the cheeks. In man they are also the natural outlets of strong emotion, and are secreted in greatly increased quantity; they much more constantly accompany crises of fear, anxiety, grief, affection, and keen joy than physical pain. Old age is comparatively tearless. Some animals, especially deer, are credited with weeping tears of grief. Darwin says few animals shed tears at all; he failed to notice weeping in monkeys, but records Emerson Tennent's opinion that elephants weep with sorrow, as supported by the keepers of tame elephants.

Tears, Gate of. See GATE OF TEARS.

Tears, Vale of. See VALE OF TEARS.

Tears, Villa of. See VILLA OF TEARS.

Teasel, in botany, the genus *Dipsacus*. About 150 species are known, natives of the temperate parts of the Old World and of America. This order consists of herbaceous and half-shrubby exogenous plants with opposite or whorled leaves, and flowers in heads. The only valuable species of the order, *D. fullonum*, fuller's teasel, is four feet high, the bracts hooked, the flowers oval, pale purple or whitish. It is probably only a variety of *D. sylvestris*. It grows best in a stiff loam. The crooked awns or chaffs are fixed around the circumference of large broad wheels or cylinders, and

woolen cloth is held against them. They raise a nap on it which is afterward cut level. A piece of fine broadcloth requires 1,500 or 2,000 of them to bring out the nap, after which the teasels are broken and useless. Steel substitutes for teasels have been tried, but ineffectually; they are not sufficiently pliant, and tear the fine fibers

FULLER'S TEASEL.
a, a bract.

of the cloth. Also in mechanics and cloth manufacture, any contrivance used as a substitute for teasels in the dressing of woolen cloth.

Tebeth, the 10th month of the Jewish ecclesiastical year, beginning with the new moon in December and ending with the new moon in January.

Technology, the science which treats of the arts, more particularly the mechanical. It is properly the science of the arts. Its object is not itself, *i. e.*, the practice of art, but the principles which guide or underlie art, and by conscious or unconscious obedience to which the artist secures his ends. In its ordinary acceptation, however, it includes only the utilitarian arts, and in fact only some of these. Painting, sculpture, music, poetry, do not come within its sphere. It deals only with the industrial or necessary arts, according to the division generally adopted, to the mechanical and chemical arts, according as they relate mainly to physics or to chemistry.

Technology, Schools of, institutions for the training of students in the industrial arts and exact sciences; chiefly civil, electrical, mining, and mechanical engineering. The first school of this kind was the famous École Polytechnique, of France which was founded in 1794; and which still holds a preëminent place. In the United States the first school was established by Stephen van Rensselaer at Troy, N. Y., in 1824. Since then their growth has been rapid. At the end of the school year 1901, there were 1,299 instructors, 11,546 students, and 43 schools, with an aggregate income of $4,373,096. Among the most important, with their year of opening, are, Alabama Polytechnic Institute (1872); Georgia School of Technology (1888); Armour Institute of Technology (1893); Massachusetts Institute of Technology (1865); Stevens Institute of Technology (1871); Rensselaer Polytechnic Institute (1824); Case School of Applied Science (1881); and Worcester Polytechnic Institute (1868).

Teck, an ancient German principality, named from a castle on "the Teck," a limestone peak in the Swabian Alb, 20 miles S. E. of Stuttgart. Held by various families from the 11th century on, it passed in 1498 to the Dukes of Würtemberg. In 1863 the King of Würtemberg conferred the principality on Duke Albert of Würtemberg's son (born 1837), who in 1866 married the Princess Mary of Cambridge. Their daughter, Princess May, was engaged to be married to the Duke of Clarence, who died Jan. 14, 1892.

Tecoma, in botany, a genus of *Bignoniaceæ*. Calyx campanulate, five-toothed; corolla with a campanulate throat and a five-lobed bilabiate limb; stamens didynamous. Erect trees, shrubs, or scandent plant, with unequally pinnate or simple digitate leaves; flowers yellow or flesh-colored, in terminal panicles. *T. radicans*, from the Southern States of the American Union, is a favorite climber in European gardens. The leaves have nine acuminate, serrate leaflets. The roots of *T. stans* and *T. speciosa* are diuretic. *T. impetiginosa* abounds in tannin; the bark is bitter and mucilaginous, and is used in lotions and baths in inflammation of the joints and debility. The bark of *T. ipe* is used in Brazil as a gargle in ulcers of the mouth. *T. undulata*, an evergreen shrub from the N. W. of India, produces gorgeous orange-colored blossoms in April; its leaves are used as cattle fodder.

Tectibranchiata, a division of gasteropodous mollusca, comprehending those species in which the gills are protected by a shell, or by the mantle, including the sea-hare and others.

Tectochrysine, in chemistry, $C_{16}H_{12}O_4$; a crystalline substance found together with

chrysine in poplar buds, and separated from the latter by its solubility in benzol. It forms large sulphur-yellow monoclinic prisms, melting at 130°. When boiled with strong potash it is decomposed, yielding acetic acid, phenyl-methyl ketone, and benzoic acid.

Tectona, in botany, the teak; a genus of *Viticeæ*. Calyx five or six-toothed, ultimately becoming inflated; corolla gamopetalous, five or six cleft; stamens five or six; ovary superior, four-celled; fruit a four-celled nut or drupe, woolly, spongy, and dry seed, one in each cell. Known species two, *T. grandis* and *T. hamiltoniana*, a deciduous tree with light-brown, hard, close-grained wood weighing 64 pounds per cubic foot. It is found in Prome and in Upper Burma.

Tectonarchinæ, in ornithology, bower-birds; a sub-family of *Paradiseidæ*. Devoid of flowing plumes, only one genus possessing any attempt at extra adornment in the males. The species, so far as known, are accustomed to erect bowers of reeds in which they disport themselves. Genera: *Serieulus*, *Ptilonorhynchus*, *Chlamydodera*, *Ælurædus*, and *Amblyornis*.

Tecumseh, an American Indian; born near Springfield, O., about 1768; first appeared in a fight with Kentucky troops on Mad river in 1788. In 1805, with his brother, Ellskwatawa, he projected the union of all the Western Indians against the whites. His defeat in the battle of Tippecanoe ruined these plans, but he continued his efforts among the Southern tribes, and ultimately succeeded in inciting the Creek Nation to insurrection. He then joined the English, and commanded the Indian allies in the campaigns of 1812–1813. He was in the action of Raisin river, and after being wounded at Maguaga was made a Brigadier-General in the royal army. He led 2,000 warriors in the siege of Fort Meigs, where he saved the American prisoners from massacre; and commanded the right wing under General Proctor in the battle of the Thames, Canada, where his Indians were driven back and he himself killed Oct. 5, 1813.

Tecumseh, The, a single-turreted, iron-clad monitor of the United States navy. During the Civil War under the command of Captain Craven, it formed a part of Admiral Farragut's fleet in the attack on Mobile, Ala., and was sunk by a torpedo in Mobile Bay Aug. 5, 1864.

Te Deum (*"Te Deum laudamus,"* "We praise thee, O God"), a well-known Latin hymn of the Western Church — so called from its first words — sung at the end of matins on all feasts except Innocents' Day, and on all Sundays except during penitential seasons. The hymn is one of the most simple, and at the same time the most solemn and majestic, in the whole range of Latin hymnology. Its authorship is uncertain. The chronicle of Bishop Datius of Milan (died about 552), which is both unauthentic and worthless, describes the "Te Deum" as the joint production of St. Ambrose and St. Augustine, into which they both burst forth by a common inspiration on occasion of the baptism of Augustine. Hence the "Te Deum" is commonly called the "Ambrosian Hymn." The first actual reference to it is in the rule of Cæsarius of Arles, who was made a bishop in 502, and it is at any rate certain that it arose as early as the 5th century, and in its modern form was used by Hincmar of Rheims in the 9th century. It is ascribed by some authorities to Hilary of Arles, by others to some disciple of Cassian of Marseilles, but in no case is the evidence at all satisfactory. The hymn in its current form consists of 29 verses; the first 21 verses are uniform in the four oldest versions current, and it seems probable that verses 1-10 were a Greek hymn dating back to the 2d century, though Bishop John Wordsworth in Julian's "Dictionary" thinks verses 7-9 are a reminiscence of Cyprian, not vice versa, and that the Greek form of verses 1-10 is a translation from the Latin, not an original composition. In the Anglican morning prayer it follows the first Lesson, except when the Benedicite is preferred as its alternative. It is frequently used also in the services of both Presbyterian and Congregational Churches, and there are more than 20 metrical renderings of it in English hymnology.

Teel, or **Teel-seed,** an Indian name for *Sesamum indicum* and its seed.

Tees, a river in the N. of England, rising on Cross Fell, in Cumberland, and flowing 70 miles E., mainly along the boundary between Durham and Yorkshire, till it falls into the North Sea, 4 miles below Stockton. Owing to works carried out since 1853 it is now navigable to that town for vessels of large burden, those works including the construction of two breakwaters at the mouth.

Teeth. See Tooth.

Teetotum (for *T-totum*, from *T*, the most important mark on one of the original four sides, meaning take-all), a small four-sided or polygonal toy used by children in a game of chance. The four sides were marked with letters, P (put-down), N. (nothing), H (half), T (take-all), such letters deciding whether the player put into or took out of the pool, according to the letter appearing on the top after the toy has been spun round.

Teff (*Eragrostis abyssinica*), a grain extensively cultivated in Abyssinia, having seeds about the size of those of millet.

Tegenaria, in zoölogy, the typical genus of *Tegenariidæ*. It contains the house spider, under which there appear to have been confounded two species: *T. domestica* and *T. civilis*, the former with proportionately longer legs than the latter. It is, besides, rather more than half an inch long, while the other one is rather less. They weave their webs in the corners of windows, of neglected rooms, or outhouses. They live about four years, and deposit their eggs in lenticular cocoons of white silk, and again in a silk bag disguised by plaster, etc.

Tegenariidæ, a family of spiders, tribe *Dipneumones* and its sedentary division. The ocelli are in two rows, the first pair of legs usually the longer; the web irregular. Sometimes there are three claws. It is a large family, in some classifications divided into the sub-families *Drassides, Dysderides, Scytodides, Ciniflonides,* and *Agelenides.*

Tegea (tej'ē-ä), a city of Arcadia, in ancient Greece. It took part in the battle of Platæa in 479 B. C.; was on the side of Sparta in the Peloponnesian and Corinthian wars, but opposed her at the battle of Mantinea in 362 B. C.; and joined the Arcadian Confederacy and the Ætolian and Archæan Leagues. Tegea contained a famous temple to Athena Alea, which was burned about 394 B. C., but restored by Scopas. It was a peripteros of Doric architecture, 154 feet long by 72 feet wide, with respectively 13 and 6 columns. The E. pediment bore sculptures representing the slaying of the Calydonian boar; the W. pediment, the combat of Achilles and Telephus. The columns of the cella were Corinthian and Ionic.

COIN OF TEGEA.

Tegner, Esaias, a Swedish poet; born in Kyrerud, Värmland, Nov. 13, 1782. In 1799 he entered the University of Lund, where he studied theology and philosophy, and became "Adjunkt" of Æsthetics in 1805, and Professor of Greek in 1812. After he had been elected to the Swedish Academy in (1818), and graduated in theology, he was appointed Bishop of Wexiö, where he remained till his death. His first great works were his "Svea" (1811), crowned by the Academy; the idyl "Nattvardsbarnen" (1821), and "Axel" (1822), whose subject is drawn from the age of Karl XII. It was by his "Frithjofs Saga" (1825) that Tegner won his highest fame. This poem has been translated into almost every European language. Its German translations number 19, of which the best are by Simrock (1875), Zoller (1875), Von Kleinburg (1875), and Möhnike (1877). Two works left incomplete at his death are "Helgönabacken" and "Gerda," the latter an epos placed in the time of Valdemar the Great. Tegner's "Samlade Skrifter" have been published by his son-in-law, Böttiger (7 vols. 1847–1850), and his posthumous works by El Tegnér (3 vols. 1873–1874). In poetry Tegnér holds a place between the blind imitators of French models and the "New School" of Atterbom, that found its ideal in German romanticism. His rich humor and lively fancy, his warm and manly feeling, and his wealth of high thoughts expressed in noble forms, entitle him to rank among the greatest of recent poets. His minor pieces are instinct with strength and freedom, and move with the easiest idyllic grace. The critic Georg Brandes, in a monograph on Tegnér, ranks him as a poet below Runeberg and Bellman, but thinks he is "far more genuine" than they, "a whole man; an honest, ingenuous mind with an ardent love for the beautiful and true." He died in Wexiö, Sweden, Nov. 2, 1846.

Teguexin, in zoölogy, a popular name for any individual of the *Tejidæ*, specifically *Tejus teguexin*, with a wide geographical range in South America. It is from three to four feet long, black on upper surface, sprinkled with yellow, tail mingled with yellow and black, lower parts similarly marked. These lizards are found in sugar plantations, and among scrub and brush; they can swim well, but do not take readily to the water. The legend that they utter a warning sound on the approach of wild beasts (whence they are sometimes called safeguards) is apparently without foundation. They feed on fruit, insects, snakes, frogs, birds' eggs, and young birds.

Teheran, or **Tehran,** the capital of Persia; 70 miles S. of the shore of the Caspian Sea; on a wide plain, dotted here and there with mud-built villages, and pierced with many circular pits, which reach down to the great subterranean watercourses, on which, in this region, the life of animal and plant is altogether dependent. To the N. runs in a general E. and W. direction the lofty range of the Elburz Mountains, rising in Demavend to the height of nearly 20,000 feet above sea-level. The old wall and ditch (4 miles long) were leveled in 1868, and the space thus gained made into a much needed circular road or boulevard. Fortifications, consisting of a bastioned rampart and ditch, were at the same time commenced on a much more extended scale. This enceinte, with its 12 gates and enclosing an area about 10 miles in circumference, was completed in 1873. The town rapidly extended beyond its old limits, more especially on the N. side, where many fine streets, gardens, and buildings soon made their appearance, among which may be spe-

cially mentioned the handsome buildings and grounds of the British Legation. The Shah's palace, entirely reconstructed since 1866, occupies the citadel, and is both spacious and cheerful, its large courtyards being laid out with gardens and numerous fountains. Besides his town palace, the Shah has five others in the immediate neighborhood, which he occupies at different seasons of the year. The foreign legations and rich natives are also in the habit of resorting in summer to the cool slopes at the foot of the Elburz, where many of them have commodious houses and fine gardens.

The bazaars, some of which are very handsome structures, are filled with every kind of native and foreign merchandise. From Teheran lines of telegraph radiate in almost every direction to the extremities of the kingdom, by far the most important being the lines of the Indian Government Indo-European Telegraph Department and those of the English Indo-European Telegraph Company. In 1886 a short line of railway was constructed from Teheran to Shah Abdul Azim, a shrine and place of pilgrimage about 6 miles S. of the town. Tramways were also laid down in different parts of the city; and gas was introduced (by a Belgian company) in March, 1892. In the vicinity of Teheran are the ruins of Rei, the "Rhages" of the Book of Tobit, known in the time of Alexander the Great under the name of "Ragæ" and the birthplace of Harûn-al-Raschid. Pop. estimated at 210,000.

Tehuacan, a town in the State of Puebla, Mexico. It has a mineral spring and there are the ruins of magnificent temples. It is 125 miles S. E. of the City of Mexico. Pop. about 9,000.

Tehuantepec, a town, river, gulf, and isthmus in Mexico. The town is a river port in the State of Oaxaca, about 14 miles above the mouth of the river and 19 miles N. by W. of Salina Cruz. Its population is mostly of Indian origin and engaged in trade, chiefly in cotton, silk, leather, cochineal, and indigo. Pop. (1900) 10,386.

The river discharges into the Pacific Ocean, and for many years was but of slight use for navigation because of a dangerous bar.

The gulf is a bay of the Pacific Ocean, washing the coast lines of the States of Chiapas and Oaxaca, and receives the river of the same name and other streams.

The isthmus forms the narrowest part of North America, and has the gulf of the same name on the Pacific side, and the Bay of Campeachy on the Atlantic. It is about 125 miles across and forms a part of the States of Oaxaca and Vera Cruz. Many schemes were projected in the past for constructing a canal or a ship railroad across the isthmus, to connect the Pacific with the Gulf of Mexico, the most ambitious of which was the plan for a ship railroad worked out by the late James B. Eads, the distinguished American engineer, but nothing came from either project. In 1895 a railroad was completed between the ports of Coatzocoalcos, on the Gulf of Mexico, and Salina Cruz, on the Pacific, by the Mexican Government; but it was built in the most primitive manner and proved totally unfit for heavy traffic. On Jan. 23, 1907, a new railroad, following the line of the first and built under private contract, was officially inaugurated.

Te Igitur, one of the service books of the Roman Catholic Church; properly an extract from the Missal. It contains the canon of the Mass, from the first words of which —"Te igitur, Clementissime Pater" — it derives its name, and certain other portions of the liturgy which do not vary with the seasons or the festivals.

Teignmouth, a seaport and watering place of South Devon, England; 15 miles S. of Exeter; on the N. bank of the mouth of the Teign, here spanned by a bridge (1827) 557 yards long. Numerous villas have sprung up on the hills to the N. and along the "Den," a public lawn stretching three-fourths of a mile above the beach, and a promenade pier was constructed (1866). The two Anglican churches, St. Michael (with a good chancel, 1872) and St. James, are poor edifices of the early part of the 19th century; but a fine Roman Catholic church, in Geometrical Decorated style, has been built (1878) in connection with St. Scholastica's Abbey (1865). Other buildings are the public assembly rooms (1826), theater (1849), market house, public baths, etc. Beyond shipbuilding and fishing Teignmouth has no special industries, but there is a considerable trade. The exports are principally pipe and potter's clay and granite, and the imports, coal, culm, timber, etc. Teignmouth was burnt by the Danes (930) and French (1338 and 1690), on the last occasion losing 116 houses. Pop. (1901) 8,636.

Teinds, the name given in Scotland to tithes or the proportion of the annual produce of the earth devoted to the maintenance of the clergy. The growth of the system in Europe is recounted under TITHES (*q. v.*). In Scotland personal teinds are practically unknown; and predial teinds, natural or industrial, drawn from the fruits of land, constitute the whole teinds leviable by the Church. Predial teinds are of two kinds, parsonage and vicarage. The parsonage or greater teinds, due exclusively to the parson serving the cure, are payable out of grain at the terms Whitsunday and Michaelmas. Vicarage or lesser teinds are properly paid to the vicar, and are drawn

Teinds

from minor and accidental products, such as fowls, eggs, milk, fish, etc., according to the usage of each parish or benefice. Parsonage teinds being an inherent burden on the land, the right to levy them cannot be lost by prescription; vicarage teinds, on the other hand, being established both as to their kind and their amount solely by use, may be lost by non-use. By a statute of Victoria, provision is made for vicarage teinds on fish being commuted.

The teinds due at common law to the incumbent of the parish had previously to the Reformation been to a large extent diverted to other purposes, with the result that the acting parochial clergy were greatly impoverished. In many cases, on a vacancy occurring in a parochial charge, the patron, acting as absolute proprietor of the benefice, appropriated its teinds to a monastery or other religious house, and though the disposal of tithes to laymen had been prohibited by several Lateran Councils, grants of part of the teinds of vacant benefices were frequently bestowed by patrons on needy lay friends and relatives. Further, a considerable proportion of teinds was diverted from the support of the parochial clergy by the practice of certain Popes in granting to various orders of Churchmen exemptions from the payment of tithe out of lands held by them. Soon also a custom grew up of granting feus of these church lands *cum decimis inclusis*, a provision which transferred to the grantee the same exemption from the payment of teind which the ecclesiastical proprietors had formerly enjoyed. In these various ways the revenues of the Church had been extensively impaired long before the Reformation.

At the Reformation the great bulk of the Church lands was acquired by the crown, either by resignation or annexation. The monasteries and priories fell at first into the hands of lay commendators, appointed by the king for life; but later they were erected into temporal lordships, the grantees being styled Lords of Erection or Titulars of the Tithes. In this way the possessions of the Church were permanently transferred into the hands of laymen holding of the crown. The property of the lands erected and the right of exemption from teind, where such right existed, formed the temporality; while the teinds themselves constituted the spirituality of the benefice. For some years the presentations to vacant benefices were wholly in the hands of the lords of erection, and they also had the power of assigning to the presentees such stipends as they chose. Under the scheme known as "the assumption of thirds," however, a return was ordered of the rental of all ecclesiastical benefices within the kingdom, and factors were appointed to uplift one-third of the revenues thereof. This scheme, after being ratified by Parliament, was subsequently adopted as the basis of the plan adopted for the support of the reformed clergy. By another statute the practice of creating lords of erection received a check, and, with certain exceptions, the church lands which had been held of the crown before the Reformation were again inalienably annexed to the crown. On the restoration of bishops the annexations of their benefices and of their chapters were rescinded; on the reëstablishment of presbytery these measures were repealed, and since that date the bishops' teinds have continued to be applied by the crown to public uses and pensions.

In spite of the assumption of thirds and other measures, the provision for the support of the reformed clergy continued very precarious till the accession of Charles I. Immediately after his accession in 1625 Charles, in view of the extent to which the property and revenues of the Church had been dilapidated, executed a revocation of all grants of church lands and tithes made by James VI. to the prejudice of the crown. Next year there followed another revocation, conceived in even more ample terms, under which a reduction was brought of all erections whatever, whether made before or after the Act of Annexation. As the individuals who had profited by the prodigality of the crown were very numerous, these proceedings caused widespread alarm, and a strong petition or remonstrance was addressed to Charles, with the view of obtaining some modification of his demands. Eventually a compromise was agreed on, and the parties principally concerned entered into four submissions, under which the whole question in dispute was referred to the determination of the king himself.

By the decrees arbitral, pronounced on Sept. 2, 1629, the king's right to the superiorities of erection was affirmed, and power was given to the heritor to have his teinds valued and his yearly charge thus permanently settled. Further, the proprietor was found entitled to bring an action of sale against the titular or his tacksman, by which he could obtain right to his teinds at nine years' purchase of the value where the seller had an heritable right. The provisions of the decrees arbitral, relating to the superiorities of erections and the valuation and sale of teinds were subsequently ratified by a series of acts of Parliament in 1633. In 1627 a commission, known as the Commission of Surrenders and Teinds, had been appointed, and in 1633, for the purpose of carrying the decrees arbitral into effect under judicial authority, another commission was nominated known as the High Commission or the Commission for the Plantation of Kirks and the Valuation of Teinds. These commissioners were in-

structed to prosecute and follow forth the valuation of all the teinds, parsonage and vicarage, that were yet unvalued; they were authorized to appoint sub-commissioners within presbyteries and parishes, and to them was committed the duty of modifying a constant local stipend to every minister to be paid out of the teinds of each parish. From time to time this commission was continued with increasing powers, or rather, a succession of commissions was kept up till at the union their power and functions were vested in the Court of Session, where accordingly actions for the valuation of teinds now proceed at the instance either of a heritor or of the minister.

The teind was originally made effectual in Scotland as elsewhere by the beneficiary drawing it, that is, carrying off from the ground every tenth sheaf. This practice was very inconvenient, as the proprietor was obliged to allow the crop to remain on the ground, exposed to all the vicissitudes of the season, till the teind was drawn. Consequently, even prior to the Reformation, it was common for the beneficiary to commute his teind either for a fixed yearly payment of money or for a certain number of rental bolls. Teinds are *debita fructuum*, not *debita fundi*, and, consequently, arrears of teinds do not affect singular successors. Though prescription, as we have stated, cannot destroy the right to teinds, yet it is effectual to protect an old decree of valuation from challenge, except on the ground of some nullity *ex facie* apparent.

Tejidæ, or **Teiidæ,** a family of lizards, sub-order *Cionocrania*, with ten genera, from tropical and sub-tropical America. Scales small, granular, sometimes with larger tubercles, those of the belly oblong, quadrangular, in cross bands; large symmetrical scutes on head; tongue long, scaly, and bifid at end; dentition acrodont; no fold of skin along the sides.

Telautograph, an instrument which will at any distance transmit accurately and to the smallest detail in exact facsimile anything that may be written or drawn on the transmitting device. Two instruments are used, one to transmit and one to record. Both are nearly identical in form, size, and general arrangement, and each carries a wide strip of paper controlled by a synchronizing device which causes the one to follow the movements of the other. On the transmitter anything can be written or drawn, and the recording stylus of the receiving instrument follows the movements of the transmitting stylus or pencil and thus produces an exact facsimile of the writing or drawing.

Teledu, in zoölogy, the *Mydaus meliceps*, the stinking badger; the sole species of the genus; a small, nocturnal, burrowing mammal, found only in Java and Sumatra, and living at an elevation of 7,000 feet above the sea. It is about a foot long, with a pig-like head, stout body, very short legs, and a stumpy tail; color, dark brown, with a white band running along the back. Like the skunk, this animal has the power of ejecting an intensely fetid liquid from its anal glands.

Telegraph, a device or apparatus for transmitting signals or messages to a distance; in a general sense, any such contrivance, including the heliograph, semaphore (*qq. v.*), etc.; in a more restricted sense, an apparatus for transmitting messages by means of electricity. In 1805 Francis Hawksbee, an English physicist, began a series of experiments in electricity that led him to the discovery of induction. In 1729 Stephen Gray experimented with conductors. The invention of the Leyden jar (*q. v.*), the principle of which was discovered by Von Kleist and Musschenbroek in 1745, and the discovery of the fact that the earth and intervening bodies of water may be employed as part of an electric circuit, were among the most important early steps in the progress of invention that gradually led to the completion of the present system of telegraphy. Many experiments are recorded tending toward a practical result. In 1747 William Watson sent a shock through about 12,000 feet of wire and proved that it was practically instantaneous for the entire distance. A writer in the "Scots Magazine," in 1753, gave a detailed plan for electric telegraphy, and in 1774 Le Sage, at Geneva, erected a telegraph line having 24 wires connected to pith-ball electroscopes, each of which represented a letter. In 1811 Sömmering, regarded in Germany as the inventor of the telegraph, by decomposing water succeeded in producing distinct signals. Gauss and Weber, in 1834, contrived an electro-magnetic telegraph by which they sent signals more than a mile. In 1836 a telegraph was constructed by Steinheil in Munich, and one by Wheatstone in London. Steinheil's current was produced by an electro-magnetic machine, and Wheatstone's by a constant battery. In 1838-41 telegraph lines secured by the patents of Wheatstone and Cooke were set up on the Great Western and two other English railways.

The work of Ampère (1775-1836) in electro-dynamics did much to prepare the way for further development of the telegraph, and the nineteenth-century inventors above mentioned were greatly indebted to him, as also was the American Joseph Henry (*q. v.*), whose genius contributed largely to the final triumph of his fellow-countryman Samuel F. B. Morse (*q. v.*). Though contemporary experimenters in many countries were working toward the same end, so that it has been aptly said that the electric telegraph, strictly speaking, had no inventor, but "grew up little by little," still its invention in the form that, with various modifications,

has come to be universally used is justly ascribed to Morse. In 1832, during a homeward voyage from France to New York, he conceived the idea of writing on a distant strip of moving paper by means of a pencil worked by an electro-magnet and a single conducting circuit, and in 1844 he completed the first line between Washington and Baltimore, and transmitted the first message May 24 of that year. In 1845 the first American company, called the Magnetic Telegraph Co., was formed by associates and adherents of Morse. Ten years later the supporters of the House printing telegraph organized various companies. The Western Union Co. came into existence in 1856.

The leading principle in the Morse and other allied instruments is that, by the depression of a key or other method, an electric circuit is "closed" or completed, and a signal is transmitted along the wire to the distant station, where, on its arrival, it is reproduced by means of the action of an electro-magnet or otherwise. Electrically the Morse consists of a transmitting key and an electro-magnet and armature; while mechanically it consists of a lever, with circular wheel or disk attached to the armature, and a clockwork arrangement, by which the paper tape to be printed on is carried forward under the disk. In the first Morse instruments the marks were made on the paper with a pointed style (the instrument being thus known as the "embosser"), but by the invention of the ink writer, a form of register now much used in Europe and Asia, the legibility and permanence of the record are secured, besides the advantage that a very light current will serve to make the marks.

The instrument most in use in the United States and Canada, as well as in India and to some extent in Europe, is the "sounder," which is simply a Morse register stripped of all its parts except the electro-magnet, the lever, and the spring, the operator reading by the clicking sounds caused by the opening and breaking of the circuit. By this method the message is read and copied simultaneously, the speed of transmission is greatly increased, and experience has proven that the proportion of errors is much diminished. The American Morse alphabet, used in the United States and Canada, is as follows:

A	.—	N	—.
B	—...	O	. .
C	.. .	P	.....
D	—..	Q	..—.
E	.	R	. ..
F	.—.	S	...
G	——.	T	—
H	....	U	..—
I	..	V	...—
J	—.—.	W	.——
K	—.—	X	.—..
L	——	Y	.. ..
M	——	Z	... .
		&	. ...

Telegraph

1	.———.	9	—..—
2	..—..	0	———
3	...—.	(.)	..——..
4	....—	(,)	.—.—
5	—————	(;)	—.—.
6	.....	(?)	—..—.
7	——..	(!)	———.
8	—....	(“ ”)	.—.—.—.—

The Continental Morse alphabet is used in all other parts of the world. The signals, as given below, are arranged in the groups, and accompanied by the mnemonic phrases adopted by the British post office when, in 1870, the transfer of the telegraphs to the government rendered necessary the rapid training of thousands of operators throughout the kingdom:

	Group 1.
.	E, Earwigs
..	I, infest
...	S, summer
....	H, houses.
	Group 2.
—	T, Turnips
——	M, make
———	O, oxen
————	Ch, cheerful.
	Group 3.
.—	A, A
.——	W, wet
.———	J, jacket's
..—	U, uncomfortable.
...—	V, very!
	Group 4.
—.	N, No
—..	D, difficulty
—...	B, baffles
——.	G, great
——..	Z, zeal.
	Group 5.
.—.	R, Remember!
.—..	L, Law
.——.	P, preserves
..—.	F, freedom.
	Group 6.
—.—	K, Kindness
—.—.	C, conciliates
—.——	Y, youth
—..—	X, extremely
——.—	Q, quickly.

1,	.————	6,	—....
2,	..———	7,	——...
3,	...——	8,	———..
4,	....—	9,	————.
5,	.....	0,	—————

Each figure is represented by five signals, but on busy circuits expert clerks adopt the practice of "sending short," *e. g.*, omitting all before the last dash in the figures 7, 8, 9, and 0. It is stated that Professor Morse founded his alphabet upon information given him by his brother, a journalist, as to the numerical relation of the letters in the English alphabet, the simplest signal (a dot) being given to E, and the next simplest (a dash) to T, those letters occurring most frequently in our language. The Continental alphabet is considered preferable, as it contains no spaced letters, which sometimes give rise to errors in reading.

The process of transmitting more than one communication at the same time over the same line, known as the "duplex" method, was first introduced in the United States,

and afterward in Europe, by J. B. Stearns, of Massachusetts, who made his first successful experiment in 1852. The "quadruplex" method was invented by Thomas A. Edison in 1874. Subsequent improvements have been made, and the multiple process, in one form and another, is now extensively used, by means of which the working capacity of the lines is increased at least 25 per cent. An automatic telegraph, in which the message was transmitted from a strip of paper punched with holes representing the letters, was invented in 1846 by Alexander Bain, of Scotland, and afterward improved by Siemens, of Berlin; Humaston, of Connecticut; and Wheatstone, of England. The autographic process, transmitting a facsimile of the original dispatch, was first brought out in 1848 by F. C. Bakewell, of London, and improved by Abbé Casselli, of Florence; Lenoir and Meyer, of France; and Sawyer, of Washington, D. C. Later came the telautograph of Elisha Gray (*q. v.*). The printing telegraph for recording messages in Roman characters was first suggested by Alfred Vail, of New Jersey, in 1837, the first model being made by Wheatstone in 1841. Various modifications of this instrument by different inventors are now in use for transmitting private despatches and for the reporting of commercial and financial fluctuations.

The growth of the telegraph service in the United States can be approximately seen from the following statistics of the Western Union Telegraph Co., which in 1881 absorbed the lines of the American Union and the Atlantic and Pacific companies, and later, by purchase or lease, acquired control of almost the entire land telegraph business of the country, except that controlled by the Postal Telegraph Cable Co.

Year	Miles of Line	Miles of Wires	Number of Messages
1866	37,380	75,686	.....
1870	54,109	112,191	9,157,646
1875	72,833	179,496	17,153,710
1880	85,645	233,534	29,215,509
1885	147,500	462,283	42,096,583
1890	183,917	678,997	55,878,762
1895	189,714	802,651	58,307,315
1900	192,705	933,153	63,167,783
1905	200,224	1,184,557	[1]67,477,320
1906	202,959	1,256,147	[1]71,487,082

[1]Not including messages sent over leased wires or under railroad contracts.

The Postal Telegraph Cable Co. in 1906 owned and operated 28,137 miles of poles and cable, and operated 31,721 miles that it did not own. It used 326,815 miles of wires, and transmitted 25,500,064 messages. The length of the world's land telegraphs in 1905 was 1,300,000 miles. The increase by decades since 1850, when it was 5,000 miles, is shown as follows: 1860, 100,000 miles; 1870, 281,000 miles; 1880, 440,000 miles; 1890, 768,000; 1900, 1,180,000 miles. While telegraphs in the United States are under private control, in Great Britain and other countries of Europe governmental control has been established, in some cases with decided benefit to the service. See SUBMARINE TELEGRAPHY; WIRELESS TELEGRAPHY.

Teleiconograph, a combination of the telescope and camera-lucida, invented by M. Revoil. The image transmitted by the object glass of a telescope passes through a prism connected with the eye piece. The rays are refracted by the prism, and thrown down on a table placed below the eye piece. On a paper placed on this sketching table, the observer traces the actual outlines indicated by the refracted light.

Tel- (or **Tell-**) **el-Amarna,** a collection of ruins, on the right (or E.) bank of the Nile in Middle Egypt, between Memphis and Thebes. It is the site of the ancient Khut-Iten, founded by Amenhotep (or Amenophis) IV. (see AMENHOTEP), who built here a great temple and palace. After his death, Thebes became the royal residence, and Khut-Iten fell quickly into decay. In the archives of Amenhotep was found in 1887-88 a collection of tablets in Babylonian cuneiform, at that period—some time before the exodus of the Israelites out of Egypt—used as a kind of *lingua franca* for all Western Asia. These tablets were mainly reports from the Egyptian governors of Palestine, Syria, Mesopotamia, and Babylonia, some of whom implored help against the Hittites (*q. v.*), then pressing S. Of about 230 tablets 160 went to Berlin Museum and 82 to the British Museum. In 1891-92 Petrie conducted further explorations here.

Tel-el-Kebir (the great mound), a locality midway on the railway between Ismailia and Cairo; the scene on the morning of Sept. 13, 1882, of the capture by Gen. Sir Garnet Wolseley of Arabi Pasha's entrenched camp, defended by 26,000 men. The British loss was about 430 killed and wounded, the Egyptian 1,500.

Telemachus, a Syrian monk, known for his attempt in A. D. 404 to put an end to the gladiatorial shows. During the progress of a combat in the Coliseum, he leaped into the arena and sought to separate the gladiators. Although he was stoned to death, his act had its effect, and there is no evidence that the exhibitions occurred after that time. He was proclaimed a martyr by the Emperor Honorius.

Telemachus, in mythology, the son of Ulysses and Penelope. He was an infant when his father left home to join in the war against Troy; but during his 20 years' absence grew into manhood. Under the guidance of Athene, who had assumed the appearance of Mentor, Telemachus set out in

search of his long-lost sire, after having vainly endeavored to eject his mother's troublesome suitors from the house. Having visited Pylos and Sparta, Telemachus returned home to Ithaca, where he found his father in the guise of a beggar, and with him proceeded to slay the suitors. In modern times Telemachus is known chiefly as the hero of Fénelon's romance, which was once very popular as a school book.

Telemeter, an instrument for determining the distance of an object whose linear dimensions are known, from its apparent length or height, when viewed between two parallel wires of a telescope.

Telemicrophone, an instrument described at the Académie des Sciences, Paris, Jan. 25, 1886, by M. E. Mercadier. By telemicrophone the author understands a combined apparatus simultaneously producing the effects of the microphone and the telephone, and reversible like the latter. He has constructed instruments of this kind, for which he claims the following advantages over the ordinary microphone: The possibility of a double mode of transmission with the same apparatus; reversibility of the transmitter, whereby the reception is greatly simplified; reduction of the number of organs on the microphonic posts, and consequent diminution of the total resistance of the apparatus on the same line.

Teleology, in philosophy, a branch of metaphysics; the doctrine of final causes and of the uses which every part of nature was designed to subserve; the argument from design in proof of the existence of God. The expression "final causes" was introduced by Aristotle, and the extension which he gave to the idea of causation drew his followers away from studying the proper object of physical science. Bacon said on the subject: "Inquiry into final causes is fruitless, and like a virgin dedicated to God, produces nothing." The context shows that his objection was not to the investigation of final causes in themselves, but to the supposition that this study was a branch of physics. It was, he said, the "second part of metaphysics." His objection to its introduction into physics was not merely that it violated logical order, but that it operated as a powerful obstacle to the study of physical causes. Descartes objected to the study of final causes, believing that to do so successfully was beyond the faculties of man; and most of the French philosophers of the 18th century for various reasons ignored teleology. Modern physical science confines itself rigorously as its name suggests, to the investigation of physical causes. Also, the doctrine of ends in morality, prudence or policy, and æsthetics.

Teleosaurus, a genus of fossil crocodiles, the remains of which occur in the lower Jurassic rocks. They are found associated with marine fossils, and the peculiar modification of their skeleton seems to have specially fitted them for an aquatic life. Both surfaces of the vertebræ were slightly concave, the hind legs were large and strong, and the anterior portion of the body gradually tapered into the long and slender jaws, giving the animal the aspect of the gavial of the Ganges; but the jaws were more attenuated, and the nasal aperture, instead of being oblique, opened vertically on the truncated end of the upper mandible. The jaws were armed with numerous equal and slender teeth, slightly recurved.

Teleostei, in ichthyology, in modern classifications a sub-class including the majority of the existing species. They correspond broadly with the osseus fishes of Cuvier and the *Ctenoidei* and *Cycloidei* of Agassiz. Heart with a noncontractile arterial bulb; intestine without spiral valve; optic nerve decussating; skeleton well ossified, with biconcave vertebræ; tail homocercal (though in early stages of its development it has a heterocercal form). They are usually protected by thin imbricating ctenoid or cycloid scales, sometimes by bony plates, while in some the skin is naked. The gills are free, with one external opening protected by a gill-cover. As arranged by Dr. Günther, the Teleostei are divided into six orders: (1) *Acanthopterygii* (sub-divided into Perciformes, Beryciformes, Kurtiformes, Polynemiformes, Sciæniformes, Xiphiiformes, Trichiuriformes, Cotto-Scombriformes, Gobiiformes, Blenniiformes, Mugiliformes, Gastrosteiformes, Centrisciformes, Gobiesociformes, Chauniformes, Labyrinthibranchii, Lophotiformes, Tæniiformes, and Notacanthiformes; (2) *Acanthopterygii,* Pharyngognathi; (3) *Anacanthini* (sub-divided into Gadoidei and Pleuronectoidei); (4) *Physostomi;* (5) *Lophobranchii;* and (6) *Plectognathi.* In Müller's classification, the Teleostei were also made a sub-class with six orders: (1) *Acanthopteri;* (2) *Anacanthini* (Sub-brachii, Apodes); (3) *Pharyngognathi* (Acanthopterygii, Melacopterygii); (4) *Physostomi* (Abdominales. Apodes); (5) *Plectognathi;* and (6) *Lophobranchii.*

Telepathy, the power of communication between one mind and another by means unknown to the ordinary sense organs, and usually called thought transference. Mem-

bers of the Society for Psychical Research believe that they have established the fact that such power exists in the material universe and have attempted to turn the assumption to account in the explanation of certain unexplained natural phenomena. There are reports concerning subjects who are supposed to have developed the faculty of carrying out the unspoken will of their agents, as for instance going to sleep and acting in accordance with their silent direction. Telepathy is not clairvoyance, for it has been demonstrated by many experiments carefully made by competent persons that sensations, ideas, information and mental pictures can be transferred from one mind to the other without the aid of speech, sight, hearing, touch or any of the ordinary methods by communicating such impressions or information. Some persons can voluntarily project the mind or some independent mental activity a distance of 100 or 1,000 miles so that it can make itself known and recognized, perform acts and even carry on a conversation with the person to whom it is sent. That is to say, mind can act at a distance from and independent of the physical body and the organs through which it usually manifests itself.

Scientific work on thought transference began systematically in England in 1882, when the Society for Psychical Research was founded under the presidency of Professor Sidgwick of Cambridge.

The person whose mind is to initiate this process is known as the agent and the other as the percipient. Thus the agent draws a geometrical figure on a card and the percipient, who can neither see, hear, taste, touch nor smell what is being done, reproduces the figure. This is a common form of experiment.

Professor Crookes has outlined a theory according to which thought transference is effected by inconceivably minute and rapid ether waves. After pointing out that vibrations of ether of a certain rapidity produce light, he says that there are higher rates of vibrations which are utterly imperceptible to our senses and it is not inconceivable that intense thought, concentrated toward a sensitive being with whom the thinker is in close sympathy, may induce a telepathic chain along which brain waves can go straight to their goal without loss of energy due to distance.

Malcolm Guthrie, of Liverpool, carried out 457 experiments, 237 of which were completely successful, 70 gave no result, 82 were partially successful and 68 resulted in misdescriptions.

A very instructive series of experiments was carried on by Herr Schmoll and M. Mabire in Paris. At first the percipient sat blindfolded in the room with his or her back turned to the agents and 8 or 10 feet away from them. Afterward the percipient went into another room while the agents were selecting an object. M. Mabire put his eye-glasses noiselessly on the table in sight of two other persons. Mlle. Louise, who was blindfolded and whose back was turned, said after five minutes: "I see two curves open above that do not touch each other."

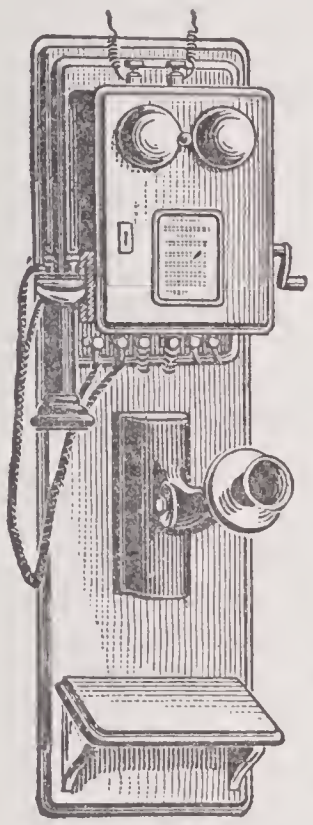
The Society for Psychical Research in the United States publishes in its "Proceedings" for 1892–1895 the remarkable case of Mrs. Piper, who was a test medium. She showed not only a great intimacy with the present thoughts of her sitters but with their past. The theory of verdical illusion is that one who is dying or passing through some great crisis is best able to serve as an agent to project impressions and produce illusions. By exerting the will to that effect one can make oneself appear present to a friend at a great distance. There have been several successful experiments of this sort.

Telephone, an instrument for transmitting sounds or speech to distances where such would be inaudible through aërial sound waves. This definition excludes speaking tubes, which act simply by preserving and concentrating sound waves. Telephonic action depends on the fact that sound waves in air are capable of communicating vibrations to a stretched membrane, and if by any means such vibrations can be transmitted with true resemblance to another membrane at any distance, such receiving membrane will reproduce the sound. This capacity of a single vibrating membrane to reproduce the most complicated sounds, as of speech, is in reality the greatest mystery connected with the matter; all else relates to the mechanism of transmission only. The essential nature of the operation is well shown in the common toy telephone sold in the streets, in which the floors of two small tin cups consist of stretched membranes, or even of paper. The two membranes are connected by a long piece of twine. If now one cup be held to the mouth and spoken into, the voice communicates vibrations to the membrane. The stretched twine communicates similar vibrations to the membrane of the other cup, and if its cavity be held to the ear the sounds will be heard. This is the true mechanical telephone. The term is more commonly applied to the electrical telephonic apparatus so much used in modern life, but the principle is precisely similar. Such apparatus generally belongs to one of two main classes.

The true inventor of the first was undoubtedly Philip Reis, who showed, in 1861, that variations in an electric current caused by a vibrating membrane could reproduce

Telephone

the necessary vibrations. Reis in this way transmitted musical sounds and even words; but his apparatus was imperfect, and it was reserved for Alexander Graham Bell to perfect that which is still commonly used and known as the Bell telephone, though it is the nearly unanimous opinion of electricians that Bell's patent has been held by courts of law to cover far more ground than is really due to him, much to the public detriment and to the hindrance of progress. In Bell's telephone there is a cylindrical steel magnet, surrounded at one end by a coil of wire, whose ends are connected by wires with the circuit, or line wire. It will now be understood that any change in the power of the magnet will cause currents in this wire. Near, but not touching, the magnet's end is stretched a very thin sheet of iron, as a membrane, which is spoken to through the mouthpiece. Thus made to vibrate, the iron membrane approaches to and recedes from the magnet; and as it acts toward this as an armature, tending to close the magnetic circuit, the effect is to produce fluctuating degrees of free magnetism, which again produce fluctuating or undulating currents in the line wire. But if these fluctuating currents are received in a precisely similar instrument, they in its coil produce variable magnetic force in the magnet, and this reproduces vibrations in the second iron membrane, which reproduce the sound. The second class of instruments are based on the microphone. If part of a galvanic current is composed of two or three pieces of matter (preferably charcoal) in loose contact, variations in the current produce variations in the contact pressure of the loose pieces, and the converse. Hence, instead of a vibrating membrane causing undulating currents by means of a magnet as in the Bell method, it may abut against such a series of mere contacts, and thus cause an undulating or variable current, which again is capable of the converse action. A microphone is thus capable, with more or less modification, of being used as a telephone, and the employment of either method is a question of practical conditions. The Bell telephone is independent of any battery, being self-acting; but its feeble currents are incapable of transmitting speech to a distance; hence most of the modifications in magnetic telephones have had the design of increasing the power, as by using both poles of the magnet, and in other ways. The microphone, on the other hand, uses the power of a battery in its circuit, but in some respects appears less delicately sensitive than the free membrane. In practice it is very general to employ some form of microphone as the transmitting or speaking instrument, and the Bell telephone, or one of its modifications, as the receiving or hearing instrument.



RECEIVER AND TRANSMITTER.

There are now many forms of telephone in use, the principal varieties being the bi-telephone, in which there are two receivers, one for each ear; the capillary telephone, in which electro-capillarity is used to produce telephonic effects; the chemical telephone, in which chemical or electrolytic action is utilized; the electrostatic telephone, which utilizes electrostatic disturbances in the reproduction of sound; the reaction telephone, in which two mutually reacting coils are used; and the thermo-electric telephone in which a thermo-electric battery is used. The last-named telephone has never been used in practice. In 1892 a long-distance telephone was erected between Chicago and the larger E. cities and has since been in successful operation. In 1902 a patent was sought in the United States for a wireless telephone service, which the inventor claimed was equally practicable under water and on land.

Telephone, Common Battery System. Perhaps a few electrical engineers fully appreciate the scope of the improvements which have been made in telephony since the time when the telephone was first exhibited at the Centennial exposition of 1876. But the great army of subscribers certainly know nothing of the brains and money which have been lavished upon the elaboration of a telephone system that has reached its highest development in the land of its birth. The transmitter and receiver are all that each subscriber sees; and these show but little of the change which has been wrought. One apparently trifling departure, however, which has of late been noticed in the subscriber's apparatus has told the telephone users of New York that an onward step has been taken; and that departure, the only public sign of this step, is the abolition of the magneto-generator used in calling the central office, and of the substation battery.

The system which has thus discarded the magneto-generator and the station battery is technically known as the "common-battery system," for the reason that it centralizes the sources of energy hitherto distributed among the various substations. The change from the magneto to the common-battery system has rendered it necessary to reconstruct every telephone exchange in New York—a reconstruction which has

Telephone

been effected without any inconvenience to the subscriber, even though new stations were added to the system at the rate of 1,000 per month. Only on the completion of the new installation were the old boards abandoned.

The common-battery system employed throughout the United States is the result of the labors of many men, among whom may be mentioned Scribner, Hayes, Dean, O'Connell, McBerty and Carty. It is not the purpose of this article to dwell on the technical features of the system; for they would be of interest only to electrical engineers and telephone experts and would require many pages to do them full justice. The labors of Scribner and his compeers must therefore give place to a cursory description of the working of an exchange — that portion of the system which is perhaps of most interest to those who use the telephone in the affairs of daily life.

The telephone exchange which we illustrate is equipped with the most perfect apparatus that has yet been devised. Its long multiple switchboard meets the demands of some 5,300 subscribers' stations, the aggregate number of whose calls reaches a total of 41,000 per day.

The multiple switchboard in question is divided into two sections, known at the exchange, respectively, as the "A" board and the "B" board. It is the function of the operators of the "A" board to connect the subscribers of the exchange with each other or with lines, called "outgoing trunk lines," leading to other exchanges. It is the function of the operators of the "B" board to connect the subscribers of other exchanges, whose calls are received on "incoming trunk lines," with the subscribers of the particular exchange under discussion.

Each operator of the "A" board controls seven vertical panels of the multiple switchboard, which panels are each subdivided into small sections receiving 100 sockets or "jacks," numbered to correspond with the substation lines leading to the exchange. Every operator can reach all the subscribers of the exchange. Beneath the multiple jacks the outgoing trunk jacks for connecting subscribers of the exchange with subscribers of other exchanges are located. And beneath the trunk jacks are "answering jacks," which correspond with the stations of subscribers whose calls the operators must answer. A certain number of subscribers on "answering" jacks are assigned to each operator. Beneath each answering jack is a small incandescent lamp, which flares up whenever the corresponding receiver at the station is taken from the hook, and is automatically extinguished when the operator connects with the answering jack to answer the call. In addition to the lamps of the answering jacks a "pilot lamp" is used, which glows as long as any subscriber's lamp is alight. It is the purpose of the pilot lamp to serve as an additional means of attracting the operator's attention to her subscribers' lamp, and to enable her to respond to the call of a subscriber whose lamp may have been burned out.

On the horizontal board before each operator two sets of plugs with their cords are seated, in front of which are two series of lamps (supervisory lamps, they are termed) corresponding in number and arrangement with the plugs, and serving as signals to inform the operator when a called subscriber has answered and when she must disconnect two subscribers. Sets of ringing and listening keys complete the equipment of each "A" operator.

When a subscriber calls up the exchange, the pilot lamp and the lamp of the corresponding answering jack glow. The "A" operator inserts one of the disengaged plugs of the rear or answering series in that answering jack and asks the number desired. If the number be that of a subscriber in the same exchange, the operator first taps the edge of the multiple jack of the station wanted with the tip of the second plug forming part of the circuit which she intends to use. If the line is "busy" she gets a peculiar click in her receiver, a warning not to intrude. If the tapping does not betray a "busy" line, the plug is fully inserted. When the two plugs are in their respective jacks the two lines are connected and then the two corresponding supervisory lamps show the state of affairs. The inner lamp, connected to the answering cord, is out because the calling subscriber has his receiver off the hook; the second lamp remains alight till the called subscriber takes down his receiver, when it is automatically extinguished and the operator then knows that the two subscribers are in communication. If the called subscriber fails to answer, the one supervisory signal will glow until by persistent ringing the subscriber is made to respond. When a conversation has ended and both subscribers hang up their receivers the supervisory signals both again glow, thus commanding the operator to disconnect the two lines.

If the subscriber called for be in another exchange, the "A" operator, after having inserted an answering plug in the jack of the calling subscriber and ascertained the number desired, presses a key to her left, which places her in communication with the desired exchange, informs the "B" operator there what number is desired, and inserts her connecting plug in the particular trunk jack designated by number by the "B" operator of the other exchange. The desired connection is then completed at the second exchange after the usual "busy" test has been made. The supervisory lamp signals are here again used to inform both operators when the lines are to be disconnected.

The "B" board of every exchange is provided with multiple jacks arranged in panels similar to those of the "A" board, so that each "B" operator can reach all the subscribers of the exchange. No answering jacks are provided; nor are any required, since the operators at the "B" board merely connect other exchanges with called subscribers. Only one set of plugs (incoming trunks in this instance) and one set of supervisory lamps are needed, for the reason that the connections are half completed at the calling exchange. Ringing keys are provided, which when depressed ring the called station's bell at regular intervals until the subscriber takes down his receiver, when the ringing key automatically resumes its normal position. A line of auxiliary keys corresponding in number with the ringing keys is also provided, the depression of one of these keys serving to restore a ringing key to its normal position when a subscriber absolutely fails to answer. Each operator of a "B" board answers the calls from one exchange. The "A" operator at the calling exchange, after having answered a subscriber, speaks to the "B" operator over a service wire and instructs her what number is desired. The "B" operator designates what disengaged trunk line should be used by the "A" operator and then inserts the correspondingly numbered incoming plug of her "B" board in the multiple jack of the station called for, the usual "busy" test having first shown that the line is free. The glowing of the supervisory signal in the circuit of the particular incoming trunk line used and of the supervisory signal on the board of the calling "A" operator, indicate when disconnection is to be made.

The boards are so arranged that the work of each operator is reduced to a minimum. Only a second is required to ascertain whether or not any given subscriber of the exchange is "busy"; a few more seconds suffice to notify a calling subscriber whether any other station in New York and vicinity is "busy"; a minute or two is all that is required to gather similar information from Boston, Philadelphia, or other outlying towns.

The multiple switchboard is the most expensive and at the same time most efficient central office apparatus ever invented. Its cost is about $1,000 per foot; its elements are numbered by millions. The addition of a number of multiple jacks to a board means an addition not to one section of the board alone, but to every section; for it is the primary purpose of the multiple board to enable each operator to have within her reach all subscribers' lines connected with the exchange. The multiplying of jacks entails enormous expenditures. But the price of this increase is not the only outlay which may be lavished upon an exchange. So rapid and so radical are the advances made in telephonic communication that an exchange may often be entirely refitted to incorporate a new improvement. Next year's telephone exchange is almost certain to reveal some departure from this year's apparatus. The changes may be slight. They are costly. But they increase the efficiency of the system; and for that reason alone the end justifies the means.

Remarkable as the technical achievements in modern telephony undoubtedly are, it cannot be denied that New York owes its admirable telephone service largely to the admirable organization of the exchanges. Each exchange has its highly trained corps of operators and chief operators who answer calls and make connections with a celerity not always appreciated; its supervisors who see to it that the operators do their work promptly and aid them if necessary; its monitors, seated at properly equipped desks, assisting the operators in making difficult connections; its manager, who is the commander-in-chief of this regiment of operators, supervisors, and monitors; and its wire chief, whose business it is to superintend the technical department.

Telephoning 3,000 Miles. A most important invention has been made by Dr. Michael I. Pupin of Columbia University, New York, whereby the telephone, overland or submarine, may be used over a distance of 3,000 miles. This is a revolutionary invention of prodigious importance, for it is commercially practicable. It has already been bought by the Bell Telephone Company — whether to develop or to suppress will be seen.

By applying the invention to a telephone line a man in New York may talk with a man in San Francisco; and, by applying it to a submarine cable, a conversation may be held between New York and London. If telephone service becomes cheap, as some time it must, the possibilities of this extension of its usefulness are unlimited. The most imaginative mind can hardly foresee what new conveniences and pleasures may come of it. Moreover, the telephonic transmission of sound over short distances or over reasonably long ones — say a few hundred miles — may be made much more distinct than it now is. A conversation between New York and Chicago may be as easily heard as a conversation between two parts of the same city. The invention is so simple that to persons who know little about electricity it seems incredible. The device consists of putting coils of wire at certain intervals about the wire which transmits the waves of sound. This device makes a difference in the vibrations and preserves them a greater distance.

The imperfections of the electrical conductors have hitherto limited the distances over which telephonic conversation can be carried on. On long lines of wire the waves

Telephoning

gradually decay and become too feeble to be reproduced by the receiving apparatus. It had been suggested that by introducing frequent induction coils into the circuit some improvement might be made, but the theory had never been worked out by a mathematical formula, and various attempts had failed for this reason.

Dr. Pupin began his experiments by observing the propagation of a wave along a cord. Suppose that a long cord be attached to some mechanism at the top of a high tower, and that we wish to transmit motion to this mechanism by vibrating the end of the cord at the bottom of the tower; everybody knows that if the lower end of the cord be rapidly shaken a wave will travel up it, and reaching the top will jerk the mechanism back and forth, and might thus produce the desired motion, in a properly designed machine. If the cord be a very light one, it will be necessary to swing it violently to and fro in order that the jerks at the top may be sufficient to cause any appreciable effect. If the space around the cord were filled with water instead of air, agitate the lower end as violently as we might, the waves would quickly die out, and none of the energy given to the cord would reach the top. Substitute a heavy cord for the light one. A comparatively small wave started in such a cord would affect the mechanism at the top. If we make the cord heavy enough, we may transmit the power to the top by so small a to-and-fro movement that even in water it would not be lost. But we need not use a continuously heavy cord. It will be sufficient to load it an intervals with leaden weights. Every electrician knows that an electric current in a conductor wound in a close coil has something of the properties of a heavy body. It is difficult to start a current in such a coil, just as it is difficult to start a heavy body into motion; but, once started, it is also difficult to stop it.

With the effect of the loaded cord in mind, Dr. Pupin concluded that if he loaded an electric current by making it flow through a conduction that is at intervals coiled into close coils, he would accomplish the same results with a far lesser current; and that far less energy would be frittered away in overcoming the resistance of the conductor, and that it might, therefore, produce its effects at a far greater distance. This, then, in a nutshell, is Dr. Pupin's invention. He greatly increases the self-induction of the line by inserting in it at intervals coils of wire. But the mere conception of the method to be pursued is not all. Many questions as to sizes and proportions had to be solved. How large must be those coils of wire? How many turns? What size of wire? How frequently placed along the conductor? Will the advantage gained warrant the expense? To answer these questions required an intricate mathematical calculation. By such an analysis he determined what must be the character of his transmission line, and he proceeded to construct such a line in his laboratory and to test its working. The first line did not prove his theory, nor the second; but the third cable, 250 miles long was successful. In this it was found that without the introduction of the coils only $\frac{1}{250000}$ part of the current reached the receiver, while with the coils brought into the circuit at proper distances a fortieth of the original current reached the receiving end.

On a land telephone line it is sufficient to insert these coils of wire about every two miles. They may be small, plain coils of wire, insulated and wound on a spool, without mechanism of any kind, placed on the tops of poles; and they will be inconspicuous. On an ocean cable the coils must be put much nearer together than on a land line, but the mathematical theory tells how near — about one-eighth of a mile — and what must be their dimensions — about 2 x 2 x 3 inches. They must be so constructed as to form part of the ocean cable and be included in its protecting sheath.

Dr. Pupin is still a young man, not yet 43, for he was born on the military frontier of Austria in 1858. He came to America at the age of 16. As he himself frankly states it: "I ran away from school, and came here to earn my way by working in the shops and elsewhere." But he worked into Columbia College and graduated there in 1883. He went to Cambridge University in England after his graduation and studied the higher mathematics. He was the first American student to receive the John Tyndall fellowship, upon which he went to Berlin and studied physics under Helmholtz, and took his degree of Ph.D. Up to this time he never had felt any particular interest in electricity. His studies in Berlin were directed especially to physical chemistry, which he hoped to make his life work.

He returned to the United States in 1889, but no professorships nor assistant's positions of physical chemistry opened to him, and with much regret he gave up that work to accept an instructorship in mathematical electricity which was offered to him at Columbia University, New York city. At the time of his appointment there was no electrical laboratory at the university. He went about it to create one, and often had to purchase at his own expense the apparatus needed for purposes of instruction as well as of research.

It was in 1894 that, in connection with his academic work, he read Lord Rayleigh's "Theory of Sound," and especially that part which relates to the vibration of cords. The subject interested him instantly. He extended the theory to the solution of a problem that had not before been solved, the

behavior of a heavy cord loaded at intervals with heavy masses and vibrating in a resisting medium. Five years he worked for his final results. Of what practical use could the solution of such a problem ever be? — of what use to know the behavior of a vibrating loaded cord? Yet it was the solution of this problem that led Dr. Pupin to the construction of the loaded electrical conductor, which has brought him hundreds of thousands of dollars, and which will be of incalculable value in facilitating the world's work.

It is a long step toward talking around the world; but it may yet be possible for a man to hear his own voice, as an echo, a moment after he speaks, it having traveled round the globe in the journey from his lips to his ear.

Telephotograph, The Rapid. -The Imperial German postal administration will soon begin the permanent working of the telegraph line between Berlin and Cologne by means of the wonderful new system of Messrs. Anton Pollak and Joseph Virág, of Budapest. In all probability England and America, the two biggest telegraphic nations on earth, will be the next to follow suit. The British General Postoffice has a highly favorable opinion of the sensational invention, and the American experts were simply delighted with it when they had a chance of seeing it at work in Budapest, Berlin, Fiume and other places, as well as in the United States, where extended trial demonstrations were made by the two named Hungarians on various lines between Chicago on the one hand and New York, Milwaukee and Buffalo on the other. In America and Europe the tests to which the Pollak-Virág system was put, and all of which it stood splendidly, resulted in the fairy-like speed of, according to the respective tensions and resistances, from 60,000 to 150,000 words per hour, or from 70 to 220 characters per second, though the invention — officially called "rapid telegraph," whereas in reality it is a telephotograph or phototelegraph, no "knocking" at all being done in connection with it — was then far from its present perfection, which enables it to produce as many as 160,000 words per hour on a single wire if the voltage (tension) and resistance of the line be sufficient, and to obtain telegrams in ordinary handwriting instead of in a variation of the Morse alphabet.

To arrive at all this, extraordinary ingenuity was required, more especially in the thinking out of certain technical details destined to substitute handwriting for the former signs and to combat the disturbing influences of various currents and vibrations. Everything has been managed so excellently that the apparatus, though looking rather complicated, is a marvel of simplicity in construction and handling. The chief advantages are an enormous speed on wires with very low voltage currents, a permanent and clearly legible automatic record in usual handwriting, automatic control of the receiver from the sending station, transmission from perforated paper and automatic receiving by photographing the movements of telephones' diaphragms (membranes).

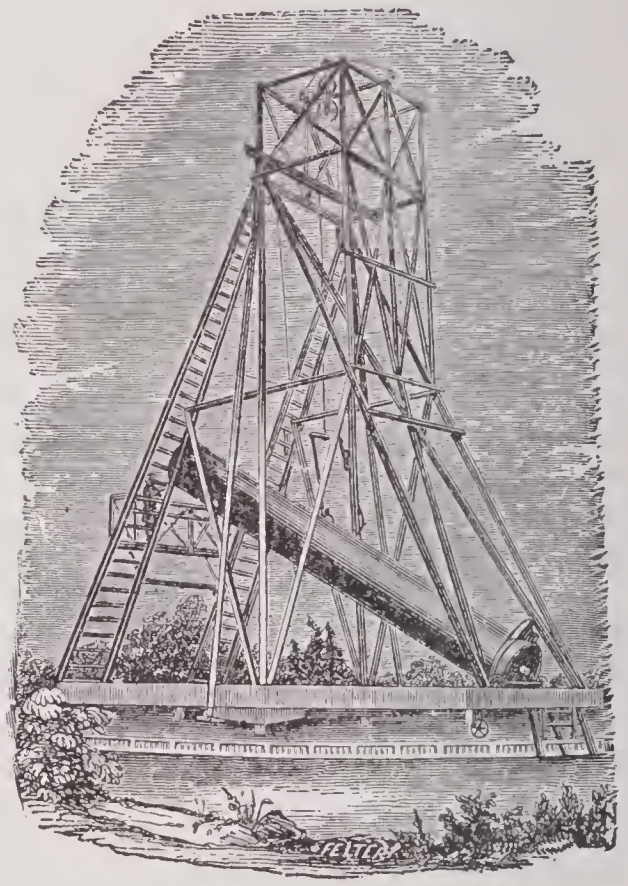
In the preparation of the message the endless paper strip, which is seven millimeters broad, is perforated just as in the Wheatstone system. Five rows of dots, dashes and ringlets represent the resultant writing, which, by the way, does not, as with the present system, appear in one long, endless line, but in as many lines as requisite under one another. Two electric brushes — one positive, the other negative — composed of fine wire, are mounted above a sort of flanged drum, or cylinder, and arranged to press the paper firmly against it. A single movement of the operator sets the apparatus at work; everything else goes on automatically. The brushes send the currents into the receiver by way of the line. In the receiver there are two telephones, connected with an ingeniously arranged little concave mirror which is kept suspended by means of a small plate of soft iron, fixed to a permanent magnet. The vibrations of the telephones' diaphragms, or membranes, communicate a corresponding movement to the mirror, whose task it is to concentrate the rays of a small incandescent lamp upon part of an endless strip of sensitized paper, nine centimeters wide, and connected with a lens. The lamp is encircled by a cylindrical envelope, through a slit of which the luminous point reflected on the mirror (*i. e.*, the message) is transversely displaced on the sensitized band, moving from left to right. After being exposed to the light, the paper passes into the automatic developing apparatus in such a way as to pass successively, and in the proper order, the photographic baths necessary to develop the marks. As soon as a telegram is ready to leave the apparatus in a finished state, the clerk at the receiving station, who keeps a constant watch on the transmitted signs through a small red window, presses against a pair of automatic scissors, which cut the telegrams off the strip, whereupon it drops out through a slit in the receiver. In spite of the fabulous rapidity of the process, the writing obtained is infallibly clear and legible, whereas too quick "knocking" on the Morse transmitter, as is well known, is apt to produce illegible messages.

Because the number of apparatus operators and the amount of wire required are infinitely smaller than in the systems in use at present, and because the repairs do not count for much, the cost of telegraphic manipulation on the Pollak-Virág system is considerably lower than in any other; con-

sequently the tariffs may be lowered correspondingly, and thus trade and civilization furthered indirectly to a very great extent. There are many more advantages; messages will not be mutilated or belated; they may be sent simultaneously, inexpensively, and without further preparations to any number of stations and directions; they can be sent secretly by being handed in on perforated slips of paper, and delivered at their destination in an undeveloped state.

Telephote, an instrument for transmitting to a distance images of objects by the agency of electricity acting on selenium. It was invented in London in 1891 by Dallmeyer and was first used in the United States by Dr. D. L. Elmendorf in 1892. At his suggestion the original telephote was simplified so as to make it a small and convenient instrument which produces the wonderful effects in photography with very little more trouble than it takes to use an ordinary camera. In a series of lectures before the New York State Board of Education in 1897, Dr. Elmendorf showed some 500 magic-lantern views of photographs of scenes in the Windward and Leeward Islands, Mexico, Colorado, Arizona, etc., all taken by the new process. By it he succeeded in photographing, at a distance of 42 miles, the Alps of the Bernese Oberland, and the Jungfrau from the town of Interlaken at least 24 miles from the mountain. Views were also shown of buildings, trees, etc., taken from a distance of 300 feet. In all of these pictures the objects were reproduced with as much distinctness as if the operator had stood within a few feet of them. The possibility of photographing from a distance objects which, if taken at a short range, would be thrown out of all perspective, is one of the greatest things that the apparatus makes possible. The machine that accomplishes these results is a cylinder only a few inches long that is applied to the camera. It consists of a negative lens which is attached to the rear of an ordinary rectilinear photograph lens. The telephote lens causes the rays diverging from the photographic lens to diverge more or less, thus, as it were, lengthening the focus of the latter. One great advantage of this arrangement is that with a camera bellows only 14 inches long one gets the effect of a lens of 40-inch focus. Another advantage is that that lens can be increased almost indefinitely. The pictures taken with this instrument are called telephotographs.

Telescope, an optical instrument to assist the naked eye in examining distant objects. It does this in two ways — by magnifying the apparent angular dimensions of the object, and by collecting more light than the pupil of the eye could alone do to form the image on the retina. One point should be noted that is often misunderstood. If any object is large enough to be seen distinctly as a surface by the naked eye, it cannot be made to appear any brighter in a telescope; in fact, it will always be fainter on account of the loss of light by reflection, and absorption in the object glass and eye piece. If, however, the object is faint and rather small to the naked eye, like a distant clock face in the twilight, it can be read more easily in a telescope. This is not because the telescope makes the face brighter and more distinct, but because the enlarged image is spread over much more of the surface of the retina, and details can be more easily



LORD ROSSE'S TELESCOPE, BERR CASTLE, IRELAND.

made out. If the person should approach the clock face till it subtended the same angular dimensions as its image in the telescope, he could read it more distinctly, and it would appear more brightly illuminated than in the telescope at the first distance, provided he shielded his eyes from surrounding stray light, which is another way in which the telescope sometimes helps in seeing faint objects. If, however, the sources of light examined are from points, like the apparent images of a star, which remain practically points under all magnifying powers, then these images will appear more and more bright the larger the aperture of the telescope, provided the whole of the emergent pencil of rays from the object glass enters the pupil of the eye. With large telescopes and low magnifying powers the emergent pencils are generally too large for this.

Telescope

Essential Parts.— The essential parts of a telescope are: (1) Either a concave mirror or a system of lenses, called the objective, for bringing to a point in the focal plane the cone of rays which proceeds from each point of the luminous object and falls upon the objective, (for objects at a very great — practically infinite — distance these cones of rays that fall upon the objective may be regarded as cylinders). (2) An eye piece consisting of one or more lenses for examining and magnifying the image formed in the focal plane of the objective. (3) A tube or frame work of some kind to hold the objective and the eye piece in their proper relative positions. These are all the essential parts of the simple telescope itself, regarded as an optical instrument only. But for the purposes of convenient use many other accessories of mounting and conveniences of handling are required. Moreover, a telescope fitted only as an optical instrument, for looking at objects simply, is of very little scientific value in these modern days of exact measurement and quantitative determination of every thing examined, so that in many forms of astronomical, geodetic, and laboratory instruments the optical telescope or microscope is only one of the important parts of the whole, the accessory apparatus attached to it, or to which it is attached, constituting in some instruments the more important feature of the whole. Moreover, for purposes of greater convenience in handling and pointing or of comfort to the observer, many considerable modifications of the optical part itself are introduced, as in the "broken back" transit, where the cone of rays from the objective of the eye piece is reflected at right angles in its course and brought out at one end of the axis, where the observer works in one position without having to follow the revolutions of the eye piece, as in the ordinary form. Also in the equatorial-coudé, or elbow-equatorial, first equatorial telescope introduced at the Paris Observatory by Loewy, the observer sits in one position at the upper end of the equatorial axis, which is itself a part of the telescope tube, the rest of it branching off at right angles from the lower end with the objective at the outer end of this branch, with a large mirror in front of this objective turning on an axis which enables the instrument to be pointed to any polar distance, and the motion of the whole round the polar axis tube reaching any hour angle from the meridian. Another mirror at the lower end of this axis reflects the rays up to the focal plane at the upper end, where the observer at the eye piece has the whole instrument under his control, and works as he would at a microscope, having, moreover, this end inclosed in a warmed room built round the eye piece end if he so desires.

Reflectors and Refractors.— Two principal forms of astronomical telescopes are in use today, reflectors and refractors. In the first the rays are brought to a focus by falling on a concave mirror, in the second by passing through a system of lenses. In this connection it is worth noting that in French the word *telescope* generally refers to reflectors, *lunette* denoting refractors. Though refractors were first invented, no very important astronomical discoveries were made, as we look at telescopic discoveries today, till the invention and use of reflectors by Herschel. His remarkable skill both in the construction and use of these instruments made an epoch in the history of astronomical discovery. There are several forms of reflectors, the Herschelian, in which the mirror is tipped a little in the tube, so that the rays are brought to a focus at the upper end near one side, the observer looking down the tube; the Newtonian, in which a small plane mirror is introduced at an angle of 45°, and reflects the beam out at the side of this tube; and the Gregorian, or Cassegranian, in which the large mirror is pierced in the center and the rays are reflected back through it from a second flat, concave, or convex mirror part way up the tube. In the first two forms the observer must work in an awkward position at the top of the telescope; in the latter he works at the bottom, as in a refractor, and the telescope is much shorter. The relative merits of reflectors and refractors have formed a large topic for discussion, and can only be summarized here in the briefest way. Reflectors are cheaper, easier to construct, and can be rendered perfectly achromatic, so that they are equally good for optical, photographic, and spectroscopic work. Here, however, their superiority ends. They are awkward to handle and use, their reflecting power constantly diminishes by tarnish so that they must be frequently repolished or resilvered, they require more accurate figuring at first, (imperfections of this kind make three times as much distortion of the image as the same imperfection on the surface of the lens), they do not give so much light for the same aperture, even in their best reflecting condition, and, most important of all, any distortion through flexure — they are very heavy — or through local effects of temperature, causes almost infinitely more distortion in the images than the same degree of flexure or distortion of a lens; for when a lens bends, one side becomes more convex and the other more concave, and these nearly counterbalance each other, while the effect of bending or distorting a mirror is to deflect the rays just

Telescope

twice the whole amount. This is why a reflector has to be humored and handled in the most careful manner, and special precautions taken in the mounting and support of the mirror; while a refractor, once finished, can be abused, neglected, banged about, so long as the lenses are not cracked or pinched in their cell, and roughly used generally, and still it will give better definition than the average reflector. Nevertheless, any one who has the time, skill, and patience to make his own mirrors, resilver them himself, and study all their peculiarities and humors will sometimes be able to produce results, especially in photography, that have as yet hardly been obtained by refractors; and an astronomer who has this degree of ability and skill can work either optically, spectroscopically, or photographically equally well in the same focal plane of the mirror for all kinds of work. A refractor corrected for optical work cannot be used with good results for photography unless a third lens is attached in front of the objective, or one of the lenses of the objective turned over and their distance changed; and, with any construction whatever in a refractor, the spectroscope must be adjusted to a different focal length for different wave lengths of the spectrum. With respect to the distortions produced by flexur, etc., in reflectors, it should be noted that any form of refractor which uses a mirror as a part of its construction is open to the same objection. It is for this reason that telescopes of the form of the equatorial-coudé, in which there are two reflections from mirrors, are not likely to be in demand where the best definition is a point to be sought after. This form of telescope makes an excellent form for a rapid and convenient comet-seeker.

Large Telescopes.— With the growth in size of telescopes their use and management becomes more difficult, and the mounting has become as important a party as any in the construction of large modern telescopes. This is necessary, for an astronomer cannot do good work in an uncomfortable and strained position, or when the greater part of his time and strength must be employed in setting the telescope on the object sought, or in reading off the circles by climbing step-ladders with a hot, greasy lamp in his hand. The introduction of the modern incandescent electric lamp has solved the question of illumination of circles, etc., in a most satisfactory manner, and the skill of the mechanician has introduced almost every possible convenience for the use of the astronomer in handling and measuring with his instrument. The following is a list of refractions of more than 12 inches aperture:

Observatory or Owner.	Aperture in inches.		Maker.
Morrison Observatory	12	1-4	Alvan Clark & Sons.
Vassar College	12	1-3	Fitz.
Oxford, England	12	1-2	Grubb.
Ann Arbor	12	1-2	Fitz.
Greenwich	12	3-4	Merz, Troughton & Simms.
Catania-Etna	12		Merz.
Allegheny, Pa.	13		Fitz.
Columbia College, New York	13		Rutherford & Fitz.
Dudley, Albany, N. Y	13		Fitz.
Hamilton College, Clinton, N. Y	13	1-2	Spencer.
Bruxelles	14		Merz, Cooke.
Markree Castle, Ireland	14		....
Lisbon, Portugal	14	3-5	Merz & Mahler.
Nice, France	14	9-10	Henry Brothers.
Bordeaux, France	14	9-10	Merz & Son.
Royal, Brussels, Belgium	15		Merz & Son.
Madrid, Spain	15		Merz & Son.
National, Paris, France	15		Lerebours.
Harvard University, Cambridge, Mass	15		Merz & Mahler.
Pulkowa, Russia	15		Merz & Mahler.
Tulse Hill, London, England	15		Grubb.
Dunecht, Aberdeen, Scotland	15	1-10	Grubb.
Washburn, Madison, Wis.	15	3-5	Clark & Sons.
Warner Observatory	16		Clark & Sons.
Goodsell, Northfield, Minn	16		Clark & Sons.
Lowe, Echo Mountain, Cal	16		Clark & Sons.
Lowell, Flagstaff, Ariz	18		Clark & Sons.
Van der Zee, Buffalo, N. Y	18		Fitz.
University of Chicago (Old)	18	1-2	Clark & Sons.
University of Strassburg, Germany	19		Merz & Mahler.
Manila, Philippine Islands	19	1-5	Merz.
Brera, Milan, Italy	19	1-10	Merz.
Chamberlin, Denver, Col	20		Clark & Sons.
Halsted, Princeton, N. J	23		Clark & Sons.
National, Paris, France	23	1-2	Henry Brothers.
Harvard University, Cambridge, Mass	24		A. G. Clark.
Cambridge, England	25		Cooke & Sons.
McCormick, Charlottesville, Va	26		Clark & Sons.
U. S. Naval, Washington, D. C	26		Clark & Sons.
Royal, Greenwich, England	26		Grubb.
Imperial, Vienna	27		Grubb.
Royal, Greenwich, England	28		Grubb.
Meudon, France	29		Martin.

Observatory or Owner.	Aperture in inches.	Maker.
Nice, France	29 9-10	Henry Brothers.
Imperial, Pulkowa, Russia	30	Clark & Sons.
Meudon	32	.....
Lick Observatory, California	36	Clark & Sons.
Yerkes, Geneva Lake, Wis. (New Chicago Univ.)	40	A. G. Clark.

The following are some of the large reflectors:

Westmeath, Ireland	24	H. Grubb.
Royal, Edinburgh	24	T. Grubb.
Harvard University	28	H. Draper.
Marseilles	31 1-2	Foucalt, Eichens.
Toulouse	33 1-2	Henry, Secretan.
Lord Rosse, Parsonstown	36	Lord Rosse.
Bermerside, Halifax	36	Calver.
Common, Ealing	37	Calver and Common.
Paris	47	Martin, Eichens.
Melbourne	48	Grubb.
Lassell, Liverpool	48	Lassell (destroyed).
Sir Wm. Herschel, Slough	48	Herschel.
Bessemer, London	50 1-4	Bessemer.
Lord Rosse, Parsonstown	72	Lord Rosse.

See LENS: OBSERVATORY: LICK OBSERVATORY: YERKES OBSERVATORY.

Telescope Fish, or **Telescope Carp,** in ichthyology, the most highly-prized of the many varieties of *Cyprinus* (*Carassius*) *auratus*, the goldfish. The dorsal fin is absent, the tail is much enlarged, sub-triangular or tri-lobate, and the eyes which are large and protruding, are set in pedicels.

Telescopium, one of the 14 S. constellations added to the heavens by Lacaille in connection with his work at the Cape of Good Hope. It is surrounded by Pavo, Ara, Corona, Austrina, Sagittarius, and Indus. It is not a conspicuous constellation, its brightest star being of 3.5 magnitude.

Telescriptor, The, a long-distance typewriter invented by M. Hoffman, of France. This instrument is formed on the order of a typewriter, but furnished with an electric current under each key so that when a key is depressed at one end of the wire instantaneous currents can be sent to any distance. These currents actuate a polarized magnet which controls the escapement of a clock-work arrangement. The axis of this clock-work is supplied with a brush that sweeps over a fixed current distributor that has 28 contacts and a type wheel. This type wheel is shaped like a disk, on whose circumference are engraved in relief the letters of the alphabet, the digits and various signs, and it has in all 56 divisions, of which four are for letter spaces and four for figure spaces.

In front of the type wheel on a movable drum passes a little paper band for receiving the impression, this drum being placed at the end of an oscillating lever under control of a special electro-magnet. The operator strikes the keys exactly as if he were writing on a typewriter, and the words come out on a strip of paper that unrolls before him, while at the same time the message is being written before the eyes of the man at the other end of the line. The peculiar value of the "telescriptor" is that it leaves a printed record of communication both with the sender and the receiver. A somewhat similar machine has been invented by F. Hachmann, of Milwaukee, Wis., by which a speed of 150 words a minute can be attained by an expert operator. The claim is also made that it is impossible for an error to occur in transmission, and in the absence of an operator at the other end, the message is written automatically. Messages have been sent successfully over 1,000 miles by this instrument.

Telespectroscope, in optics, an instrument for observing the light from the planets and fixed stars, for ascertaining their physical condition and the composition of their atmospheres. It consists of a spectroscope placed at the end of a telescope, and containing two prisms, while the image of the star is brought to the slit of the spectroscope, which is one three-hundredth part of an inch in breadth.

Telestereoscope, an instrument described by Helmholtz in 1857 for producing an appearance of relief in the objects of a landscape at moderate distances. It consists of a frame on which are set at a convenient distance — say 4½ feet — apart two plane mirrors at an angle of 45°, which receive the rays of light from the objects; these are reflected to two central mirrors, forming an angle of 45° with the first, in which they are viewed by the eye. The effect produced is the same as if the eyes of the observer were at the same distance apart as the two larger mirrors. When objects at a great distance are viewed, they do not appear in strong relief, but rather as if detached from the general landscape.

Telford, Thomas, a Scotch engineer; born in Westerkirk, Scotland, Aug. 9, 1757; became a mason and worked at his trade in Edinburgh, which in 1782 he quitted for London. Here he was befriended by Sir William Pulteney, through whom he was

appointed surveyor of public works in Shropshire. He now exchanged his original occupation for that of civil engineer, and was intrusted with the construction of the Ellesmere canal. In the years 1803 and 1804 the parliamentary commissioners for making roads and building bridges in the Highlands of Scotland, and also those for making the Caledonian canal, appointed Telford their engineer, and thus an immense amount of work was carried out by him. Above 30 harbors were built or improved by him, some of which, as at Aberdeen and Dundee, were on an extensive scale. He also superintended the construction of five large bridges over the Severn, the laying down of the Gloucester and Berkeley, the Grand Trunk, Birmingham and Liverpool, and the Macclesfield canals, and the execution of numerous important works for the metropolis. In 1808 he was employed by the Swedish government to lay out a system of inland navigation through the central parts of that kingdom, which ultimately formed a direct communication by water between the North Sea and the Baltic. The greatest monument of his engineering skill, however, was the Menai Suspension bridge, connecting Caernarvonshire with the Island of Anglesea, opened in 1826. The Conway bridge was also his, as well as the Dean bridge, Edinburgh, and the Broomielaw bridge, Glasgow. He died in Westminster, Sept. 2, 1834, and was interred in Westminster Abbey.

Telinga. See TELUGU.

Tell, William, the champion of Swiss liberty; was a native of Burglen, in the canton of Uri. He was distinguished by his skill in archery, his strength and courage. He joined the league of the Three Forest cantons formed to free the country from Austrian tyranny. The Austrian governor of Switzerland, Herman Gessler, pushed his insolence so far as to require the Swiss to uncover their heads before his hat (as an emblem of his sovereignty), and is said to have condemned Tell, who refused to comply with this mandate, to shoot an apple from the head of his own son. Tell was successful, but confessed that a second arrow, which he bore about his person, was intended, in case he had failed, for the punishment of the tyrant, and he was therefore retained prisoner. While crossing the Lake of the Four Cantons, or Lake of Lucerne, in the same boat with Gessler, a violent storm arose. Tell, as the most vigorous and skillful helmsman, was set free, and he conducted the boat successfully to the shore, but seized the opportunity to spring on a rock, at the same time pushing off the boat. On this rock, since called the Rock of Tell, a commemorative monument or chapel has been erected. He had fortunately taken his bow with him; and when the governor finally escaped the storm, and reached the shore, Tell shot him dead on the road to Küssnacht. This event was the signal for a general rising, and a most obstinate war between the Swiss and Austrians, which was not brought to a close till 1499. The uprising is said to have happened on Nov. 7, 1307; and the citizens having previously chosen for their leaders three men of approved courage and abilities, namely, Werner of Schwytz, Walther Fürst of Uri, and Arneld Melchthal of Unterwalden, they secretly agreed to surprise and demolish the castles in which the imperial governors resided. This compact being effected, these three cantons joined in a league for 10 years, which gave birth to the Helvetian Confederacy.

Teller, Henry Moore, an American statesman; born in Granger, N. Y., May 23, 1830; was admitted to the bar in 1856; practised law in Illinois in 1858–1860; went to Colorado in 1861; was Major-General of the Colorado militia in 1862–1864; United States Senator in 1876–1882, and 1885–1897; Secretary of the Interior in President Arthur's Cabinet in 1882–1885; and was a delegate to the National Republican Convention in St. Louis in 1896, from which he withdrew because of a financial plank in the platform. He was again elected to the United States Senate in 1897.

Téllez, Gabriel, Maestro Fray, a Spanish dramatist; born in Madrid, Spain, some time between 1570 and 1585. He is said to have written about 300 plays, but only 59 are extant. The most famous is "The Jester of Seville." He wrote several autos or religious pieces; and two collections of stories after the fashion of the "Decameron." He died in Soria, Spain, about 1648.

Tellia, in ichthyology, a pseudo-genus of *Cyprinodontidæ*, erected for the reception of such species of the type genus *Cyprinodon* as have lost their ventral fins, either from living in limited localities or from their habit of concealing themselves in the mud.

Tellicherri, a seaport town and military station of British India, in the district of Malabar, Madras presidency. The site of the town is very beautiful, and the neighboring country highly productive. There is a natural breakwater abreast of the fort, formed by a reef of rocks running parallel to the shore. The town, with suburbs, occupies about 5 square miles. Coffee, cardamons, and sandalwood are the chief exports. The East India Company founded a factory here in 1683, which was reduced to a residency in 1766. Pop. (1901) 27,883

Tellina, in zoölogy, the type genus of *Tellinidæ*. Shell ovate, oblong, rounded in front, angular behind; valves smooth or

marked with radiating striæ. The animals have the power of leaping from the bottom by means of their muscular foot. The genus is cosmopolitan, most abundant in the tropics; more than 300 species have been described. Fossil species 170, from the Oölite onward.

Tellina Balthica Clay, in geology, a clay characterized by the abundance of *Tellina balthica*. According to some authorities, it forms the base of the whole glacial series, and indicates the setting-in of the great glacial subsidence.

Tellinidæ, in zoölogy, a family of *Sinupallialia*, with 11 species, to which Tate adds three others. Shell equivalve, closed and compressed; cardinal teeth two; siphons separate, long and slender, siphonal fold large; foot tongue-shaped. The family appears first in the coal measures.

Tellurethyl, in chemistry, $Te''(C_2H_5)_2$; ethyl telluride or telluric ethide; a heavy oily, yellowish-red liquid, obtained by distilling potassium telluride with potassium ethyl sulphate. It is very inflammable, has a disagreeable odor, and acts as a bivalent radical, uniting with chlorine, bromine, etc., to form compounds.

Telluric Acid, H_2TeO_4; a crystalline body obtained by fusing equal parts of tellurous oxide and sodium carbonate, dissolving the product in water precipitating by means of barium chloride, and decomposing with sulphuric acid. It has a metallic taste, reddens litmus paper, and is freely, although slowly, soluble in water. The tellurates of the alkali-metals are soluble in water, the others are insoluble.

Telluric Oxide, TeO_3; obtained by strongly heating crystallized telluric acid. It is insoluble in water, and even in a boiling alkaline liquid.

Tellurion, an apparatus for the purpose of illustrating to the eye the real and apparent movements of the earth; exhibiting the ellipticity of the earth's orbit; the position of the sun, represented by a lamp in one of the foci of that ellipse; the inclination of the pole to the plane of the ecliptic, and the constancy of the pole during the entire yearly revolution; the apparent movement through the constellations of the zodiac; the phenomena of eclipses, day and night, sunrise and sunset, and the seasons; the varying declination of the sun; the equation of time; the motions and phases of the moon; and affording a model whereon to illustrate the theory of the tides, lunar disturbances, etc.

Tellurium, in chemistry, symbol Te, at. wt. 128, an element of rare occurrence, found in few minerals, in association with gold, silver, and bismuth. It possesses many of the characters of a metal, but bears so close a resemblance to selenium in its chemical properties that it is generally placed in the sulphur group. It has the color and luster of silver, is very brittle, a bad conductor of heat and electricity; sp. gr. 6.26; melts below a red heat, and volatilizes at a higher temperature. Like sulphur, it forms both oxides and acids. It occurs in six-sided prisms with basal edges replaced; crystallization hexagonal; has lately been found in more complex forms; more often massive and granular; hardness, 2–2.5; sp. gr. 6.1–6.3; luster, metallic; color tin-white; brittle; composition, tellurium and gold, with occasionally some iron; originally found at the Maria Loretto mine, Transylvania, where it was melted for the gold it contained. It has been recently found associated with various tellurides, in several of the United States.

Tellurous Acid, H_2TeO_3; a bulky precipitate prepared by dissolving tellurium in nitric acid of sp. gr. 1.25, and pouring the solution into water. It has a bitter metallic taste, is slightly soluble in water, but soluble in alkalies and acids.

Tellurous Oxide, TeO_2; a semi-crystalline powder prepared by heating tellurous acid to a low red heat. It is fusible, volatile, and slightly soluble in water.

Telmann, Konrad, a German author; born in Stettin, Germany, Nov. 26, 1854. His principal works are: "In Solitude" (1876); "Waves of Ocean" (1884); "In Pomerania" (2 vols. 1875), a collection of stories; "Dissonances and Accords" (1888), stories; "Sicilian Stories" (1889); "Athwart Life" (1890); "Dark Depths" (1895); the novels "In the Flush of Morning" (1880), "Væ Victis" (1886), "On the Sirens' Isle, Capri" (1889); "Of the Lineage of the Icaridæ" (1891), "Vox Populi" (1897); etc. He died in Rome, Italy, Jan. 23, 1897.

Telopea, in botany, a genus of *Grevillidæ*. Leaves entire or slightly toothed; flowers in terminal clusters, surrounded by an involucre. *T. speciosissima*, the waratah of New South Wales and Tasmania, is a splendid proteaceous shrub, cultivated in greenhouses.

Telpher Line, in electricity, a line on which transport is automatically effected by the aid of electricity; an electric railway; specifically, a line worked by Professor Jenkin's system of telpherage. The first line was opened at Glynde, England, Oct. 17, 1885, for the Newhaven Cement Company. It is a double line, nearly a mile long, composed of two sets of steel rails, supported on wooden T-shaped posts, about 18 feet high. A wire is supported on each end of the cross-piece of the T, which is eight feet long. The carriers, or skeps are of iron, and hold about 200

pounds each; they are furnished with handles by which their contents are tilted over by a man with a pole, or automatically tilted by these handles coming successively into contact with a wooden arm standing out from the post where it is desired that the skeps should be emptied. Ten of these carriers, which are in electrical connection with each other, form a train, and in the middle of the train is an electric motor. About half a mile from the starting point is the engine house containing the dynamos, whence the current is led to the line, and so to the motor in the center of the train. A speed of four to five miles an hour is attained, and the working cost is about five cents per ton, the skeps being empty on the return journey. The great practical advantage of a telpher line is that it can be carried through a district without any interference with the fields, rivers, or roads, that cutting and tunneling are not necessary, and that no ground has to be purchased, as for ordinary railways and tramways.

Telugu, or **Telinga,** one of the languages of India, belonging to the Dravidian group, and spoken in Southern India by about 17,000,000 people. The Telugu are the most numerous branch of the Dravidian race, but are less enterprising than the Tamils. The language is allied in roots to the Tamil language, but differs considerably otherwise.

Telson, in comparative anatomy, the last joint in the abdomen of the *Crustacea.* By some authorities it is regarded as a terminal somite without appendages, by other as an azygous appendage. The telson may be broad and spreading, as in the lobster, or ensiform, as in the king crab, while in the extinct *Eurypterida* its form was extremely variable. The name is also applied to the last joint of scorpions, which has been modified into a weapon of offense.

Tembuland, a district of the Transkeian Territories in Eastern South Africa; bounded by Cape Colony, Basutoland, and Natal. Tembuland has an excellent climate and a fertile soil, which is well suited for pastoral and agricultural purposes. The coast regions are adapted to the growth of sugar, cotton, and coffee. The minerals include coal and copper. Area, 4,122 square miles; pop. est. in 1904, 231,150.

Temesvar, a royal free city of Hungary; consisting of the fortified city or "citadel," with four suburbs; on the Bega canal; 160 miles S. E. of Budapest. It has a fine cathedral, an ancient castle, a magnificent Episcopal residence, manufactures of flour, tobacco, cloth, silk, paper, leather, wool, and oil, and a brisk transit trade in grain, wax, honey, and brandy with Transylvania, Servia, and Rumania. Temesvar has endured a great number of sieges — the latest being that of 1849, when it was besieged and bombarded for 107 days by the Hungarian insurgents, but was relieved by Haynau. Pop. (1900) 53,033.

Temme, Jodocus Donatus Hubert, a German author; born in Lette, Westphalia, Oct. 22, 1798. Among his stories are: "German Tales of Crime" (in two series, comprising 14 vols.); "Darksome Ways" (1862–1863); "The Black Village" (1863); "The Native Land" (1868). He died in Zürich, Switzerland, Nov. 14, 1881.

Temmincks' Bat, in zoölogy, *Scotophilus temminckii,* about three inches long, varying considerably in color, generally dark olive-brown above, and reddish or yellowish white below. It has a wide range in the East.

Temnodon, in ichthyology, a genus of *Carangidæ,* from tropical and sub-tropical seas. Body oblong, compressed, covered with cycloid scales of moderate size; mouth-cleft wide; strong teeth in jaws, smaller on vomer and palatine bones; no finlets, lateral line not shielded; anal and second dorsal covered with very small scales. *T. saltator,* the bluefish, is highly esteemed as food.

Temnograph, an instrument designed to plot to any accurate scale a section of the ground over which it travels. It works by frictional motion governed by two pendulous weights. Invented by A. M. Rymer-Jones in 1879.

Tempe, Vale of, a beautiful valley of Northern Greece, in Thessaly, on the Peneus; much celebrated by the ancient poets, having Mount Olympus on the N. and Mount Ossa on the S.

Tempel, Ernst Wilhelm Leberecht, a German astronomer; born in Nieder-Kunersdorf, Germany, Dec. 4, 1821. He lived nearly the whole of his life in Italy and France, his astronomical work being connected with the Marseilles and Florence Observatories, he being director of the Arcetri Observatory near Florence at the time of his death. He was one of the most keen-eyed of astronomers, and his work was mostly confined to the discovery and observations of comets and nebulæ, of which he detected a large number. He was the first discoverer of the celebrated Merope nebula in the Pleiades, and he detected the first comet of 1866, which was afterward shown to move in the orbit of the November meteors. He died in Arcetri, Italy, March 16, 1889.

Tempeltey, Eduard, a German poet; born in Berlin, Oct. 13, 1832. His two dramas, "Clytemnestra" (1857), and "Here Guelph, Here Ghibelline!" (1859) were received with extraordinary favor.

Among his other dramas is "Cromwell" (1882), which was also remarkably successful. He wrote also a chaplet of songs, "Mariengarn" (1866), the theme of which is love in all its phases.

Temperament, that individual peculiarity of physical organization by which the manner of acting, feeling, and thinking of each person is permanently affected. Temperament, called by the Greeks *krasis*, meaning a mixture or tempering of elements, was anciently supposed to arise from the union of two or more of the entities, heat, cold, drouth, or moisture, corresponding to the so-called elements, fire, air, earth, and water. There were four temperaments recognized by Hippocrates, which he supposes to have arisen from the mixture of four secondary or compound elements, blood, phlegm or pituita, yellow bile, and black bile. Blood is supposed by him to be a combination of hot and moist, phlegm of cold and moist, yellow bile of hot and dry, and black bile of cold and dry. While his explanation is rejected, his four temperaments are still recognized under the names of the sanguine or sanguineous, the lymphatic or phlegmatic, the choleric or bilious, and the melancholic or atrabilious temperaments.

In music, in its broadest sense, the division of the octave, in a narrower sense, the modification of intervals from their strict mathematical value in order to secure a recurring and interchangeable series in consecutive octaves. The most common form of temperament is that now used on pianofortes and organs, known as Equal Temperament, in which the octave is divided into 12 equal parts called mean semitones; but in order to secure this, the fifths have to be slightly flatter than 3:2, and the thirds considerably sharper than 5:4. If thirds and fifths be required in just intonation, the number of keys on keyed instruments must be inconveniently multiplied; such instruments are sometimes called enharmonic. Systems of unequal temperament are such as secure perfect correctness in certain common keys at the sacrifice of the intonation of those more remote.

Temperance Movement, a movement designed (1) to minimize or (2) to abolish the use of alcoholic liquors as beverages. In the first sense the word "temperance" is used strictly, *i. e.*, the aim at moderation in the use of liquors; in the second sense it is equivalent to total abstinence. The Jewish Nazarites and Rechabites acted on total abstinence principles (Num. vi: 1–21, Jer. xxxv: 1–6), as did the Encratites of the 2d Christian century. Most of the higher Hindu castes and all the Mohammedans nominally abstain from intoxicating liquor. The earliest modern temperance order was that of St. Christopher, founded in Germany in 1517, the members of which were pledged not to drink more than seven goblets of liquor at a meal, "except in cases where this measure was not sufficient to quench thirst." In 1600 the Landgrave of Hesse established another temperance order. The United States was earlier than England in the modern temperance movement. In 1651 the people of East Hampton, Long Island, endeavored to limit the sale of intoxicating drinks. In 1760 the religious societies began to protest against drinking at funerals; in 1789 a resolution was passed by farmers to abstain from liquor during that season; and in 1790 medical men, led by Dr. Rush, protested against the use of spirits, and four years later he recommended total abstinence.

The first total abstinence pledge was drafted by Micaiah Pendleton of Virginia. In 1812 the Rev. H. Humphrey recommended total abstinence, as did Dr. Lyman Beecher, and various temperance societies arose. Not, however, till 1836 was the American Temperance Union formed on the basis of total abstinence. In 1840 the Washingtonians were founded in the city of Baltimore, and in 1842 the Sons of Temperance were instituted in New York city. From 1845 commenced the various orders with ritual and insignia, which have gradually been extended to or imitated in Europe. As early as 1818 a total abstinence society, believed to have been the first in date throughout the world, had been founded at Skibbereen, in Ireland. In England the movement began at Bradford, in February, 1830. The British and Foreign Temperance Society was formed in London early in 1831. On Aug. 23, 1832, Joseph Livesey, then a member of the Preston Temperance Society, drew up the teetotal pledge, the first signers of which are known as the "seven men of Preston." This inaugurated the modern teetotal movement. In 1838 Father Theobald Mathew, a Capuchin friar, became the apostle of temperance for Ireland, and by the end of 1839 obtained 1,800,000 recruits to the cause. The United Kingdom Band of Hope Union was founded in May, 1855. In 1868 the Independent Order of Good Templars, probably the most widespread of all temperance organizations, was planted in England by Joseph Malins. In 1873 Cardinal Manning and Father Nugent commenced a vigorous temperance movement among the Roman Catholics. The feeling in favor of temperance is steadily growing, and the numerous societies with their large membership constitute a very potent social and political force.

The National Woman's Christian Temperance Union, with its auxiliary state and

territorial unions, besides that of the District of Columbia, is the largest society ever composed exclusively of women and conducted entirely by them. It has been organized in every State and Territory of the nation, and locally in about 10,000 towns and cities. Great Britain, Canada and Australia, Hawaiian Islands, New Zealand, India and Japan, Madagascar and South Africa, have also organized, and there are local unions in almost every civilized nation. This society is the lineal descendant of the great temperance crusade of 1873–1874, and is a union of Christian women for the purpose of educating the young; forming a better public sentiment; reforming the drinking classes; and securing the entire abolition of the liquor traffic. In its political aspect the temperance question has in the United States become one of grave importance, and has formed an issue in more than one political campaign in several States of the Union. Its advocacy has assumed different forms, ranging from partial restriction to total PROHIBITION (*q. v.*). In Maine, under the earlier efforts of the apostles of total abstinence, prohibition was carried as a measure of State policy, and the Maine liquor law formed the basis of subsequent similar enactments in other States. In several of the States local option exists, and in one — South Carolina — the State has assumed a monopoly of the liquor traffic, allowing no liquor to be sold except through the medium of dispensers appointed by the boards of control, said boards of control in turn being appointed by the governor with the consent of the legislature. To enforce this law the governor has authority to employ special constables, whose pay shall be $2 per day. Iowa has a prohibition law, the provisions of which, especially that portion relating to "original packages" has occasioned much litigation. It is a significant fact that, in the localities in which women are allowed to vote, prohibition is most firmly established as a matter of governmental policy, and intemperance and its consequent evils are at a minimum.

Temperature, the thermal condition of a body which determines the interchange of heat between it and other bodies. Our first ideas of temperature are derived from our sensations of hot and cold. The effect of adding heat to a body is to make it hotter, unless it is at its melting or boiling point. This rise of temperature is accompanied by volume changes, on which all our practical methods of measuring temperature depends. Now, though the idea of temperature is familiar enough, its true significance is difficult to understand. So-called thermometric measurements of temperature are not measurements in the strict scientific sense of the term. They are simply the comparison of certain other effects which accompany change of temperature in special bodies. A scientific measure of temperature should be independent of any particular substance, and should depend solely on the fundamental properties of heat itself. This absolute measure of temperature was first given by Lord Kelvin (Sir W. Thomson), who based his system on Carnot's thermodynamic cycle. The kinetic theory of gases has given us a definition of temperature in terms of the kinetic energies of the molecules. The assumption is that the molecules are free from molecular forces; the conclusion is in agreement with Boyle's, Gay-Lussac's, and Charles's laws, As no gas obeys these laws rigorously, the inference is that intermolecular actions come into play, so that only part of the temperature can be expressed in terms of the kinetic energies of the molecules. The same is true, but in a much greater degree, for liquids and solids, for which as yet no kinetic theory has been formulated.

From experiments made by Kelvin and Joule, the absolute zero of temperature was found to be 274 centigrade degrees below the freezing point of water, or — 461° F. This agrees almost exactly with the value deduced from the kinetic theory of gases. From our present standpoint, therefore, we cannot expect to get a colder temperature. The coldest natural temperature hitherto registered on the earth's surface is — 88.8° F., which was observed in January, 1886, at Verkhoyansk in Siberia (lat. 67° 34′ N. and lon. 133° 51′ E.). Olszewski has, in his experiments on the liquefaction of the gases, measured temperatures as low as — 373° F. by means of a hydrogen thermometer. Guesses have been made from time to time as to the temperature of space, Pouillet, for example, putting it at — 238° F. and Fourier at — 58°. From our present physical outlook, however, the phrase "temperature of space" is meaningless. Only where matter is can a true temperature exist. A thermometer placed in space will receive radiations from all sides, and the temperature indicated will depend on the power it has to transform these radiations into the irregular motions which constitute heat in a body An ideal thermometer, transparent to all radiations, and capable only of receiving heat by contact with other bodies, would remain unaffected if isolated in space.

In meteorology the distribution of atmospheric temperature is one of the most important problems calling for discussion. The mean annual temperature over the whole surface of land and sea is perhaps about 45° F. At Verkhoyansk the lowest monthly mean averages — 61.2° F. The highest monthly mean averaged over several years may be set down at fully 110°

F., and is experienced in the N. W. parts of India, where the thermometer in free shaded air not unfrequently touches 125° F. Loomis in his "Meteorology" gives 133° F. as the highest authentic reading, made in the Great Desert of Africa. Exceptionally high readings made by travelers in Arabian and African deserts must, however, be accepted with great caution. It is indeed no easy matter satisfactorily to measure air temperatures, especially when they are high. It is not enough to shade the thermometer from direct sun rays. It must be shaded as effectually from reflected radiations from earth and sky; and at the same time the air must be free and not confined. To facilitate the study of the distribution of temperature at the earth's surface, it is usual to construct charts of isotherms. These are lines, each of which is drawn through all places having the same mean monthly, mean seasonal, or mean annual temperature. The most recent and complete charts of this character are those prepared and published by Dr. Buchan in his "Challenger" "Report on Air and Ocean Temperatures" (1890). They show the mean temperature (Fahrenheit) of the globe for January and July, the typical winter and summer or summer and winter months for all regions on the earth's surface. A glance will indicate how greatly the distribution of land and sea influences the distribution of temperature. In January the great land areas in the Northern Hemisphere are much colder than the ocean areas at the same latitude; in July this relation is reversed. For a full discussion of the facts embodied in these and the charts for the other months of the year, as well as of the related facts referring to barometer pressure, rainfall, humidity, diurnal changes, etc., see the elaborate "Report" mentioned above. A concise abstract, given by Dr. Buchan himself, will be found in the "Proceedings of the Royal Geographical Society" (March, 1891).

The periodic changes of atmospheric temperature are due to the sun. The earth itself has, however, a distinct temperature, which increases at the rate of 1° F. for every 50 or 60 feet of descent through the few miles of crust accessible to us. On this real earth temperature the mean annual temperature of the air must to a large extent depend. According to Professor Langley, the surface of the moon with its long "day" of a fortnight never gets hotter than the freezing point of water, however brightly it may be shone on. This shows that the moon is intrinsically much cooler than the earth.

Temperature of the Body. The terms cold-blooded and warm-blooded animals serve roughly to indicate, the former, those animals which possess a temperature little raised above that of the surrounding medium; the latter, those with one considerably higher. Fishes, frogs, and reptiles are cold-blooded animals, while birds and quadrupeds are warm-blooded. Heat is produced through the combination of the oxygen of the atmosphere with the carbon and hydrogen of the blood and tissues. A much larger quantity of carbon and hydrogen is added to the blood from the food than the ordinary nutrition of the body demands; and the oxygen inhaled from the atmosphere, uniting with these elements, produces heat, carbonic acid, and water — the latter products representing the ashes of the bodily fire. Thus the temperature of the living body depends on chemical change. It is produced by the oxidation of combustible materials derived from the tissues and from the blood. The quantity of carbon and hydrogen which in any given period unite with oxygen in the body, may be accounted for by the quantity of heat generated in the same period. The temperature of an animal must thus be proportionate to its respiration, and to the activity and frequency of its breathing movements.

The circumstances which influence the temperature of the human body in health are very varied. The normal temperature of the internal parts varies from 98.5 to 99.5. The average temperature of the armpit is 98.6. In infant life the temperature is about 1° F. above that of the adult; and the temperature of old age resembles that of infancy. The temperature of the female slightly exceeds that of the male; and the temperature of the human body falls to its lowest level in the early morning. The influence of disease on temperature is very marked. In cases of fever and all diseases accompanied by increased oxidation of tissue and by abnormal tissue waste, the temperature may rise to an almost unprecedented height. In typhus fever and pneumonia the temperature may rise to 106° F. Cases of sudden malignant fever have been recorded in which the temperature of the armpit attained 111° F., and Wunderlich has placed a case of idiopathic tetanus on record in which the temperature was 112.5° F. at the time of death. On the side of lowness of temperature may be mentioned cases of *morbus cærulcus*, in which the blood is imperfectly ærated, when the temperature may sink to 77.5° F. In Asiatic cholera the mouth temperature may be as low as 77° or 79° F., and Dr. Gee reports a case of tubercular meningitis in which the temperature of the rectum remained for some hours at 79.4° F.

Tempering, in metal work, the process of producing in a metal, particularly steel, that peculiar degree of hardness and elas-

ticity which adapts it for any of the purposes to which it is to be applied. The malleable metals generally increase in hardness by being hammered or rolled, and hammer-hardening — that is, hammering without the application of heat, is frequently employed for hardening some kinds of steel springs. Steel is for most purposes hardened by plunging it while hot into water, oil, or other liquid to cool it slowly. Nearly every kind of steel requires a particular degree of heat to impart to it the greatest hardness of which it is susceptible. If heated, and suddenly cooled below that degree, it becomes as soft as iron; if heated beyond that degree, it becomes very hard, though brittle; and its brittleness is an indication of the degree of its heat when cooled off. By the common method the steel is overheated, plunged in cold water, and then annealed or tempered by being so far reheated that oil and tallow will burn on its surface; or the surface is ground and polished, and the steel reheated until it assumes a certain color. The graduations of color consecutively follow: a light straw-yellow, violet, blue, and finally gray or black, when the steel again becomes as soft as though it had never been hardened. Bronze is tempered by a process reverse to that adopted with steel. Cooling bronze slowly hardens it. The sudden cooling makes it less frangible, and is adopted with gongs. A method of tempering much practiced of late years is by the use of electricity, by means of which the article to be tempered is heated. For tempering wire this method is said to be superior, as the process can be continuously applied without intermission.

Templars, a famous military order, which, like the Hospitallers and the Teutonic Knights, owed its origin to the Crusades. In the year 1119 two comrades of Godfrey de Bouillon, Hugues de Payen and Geoffroi de Saint-Adhémar, bound themselves and seven other French knights to guard pilgrims to the holy places from the attacks of the Saracens taking before the patriarch of Jerusalem solemn vows of chastity, poverty, and obedience. King Baldwin II. gave them for quarters part of his palace, which was built on the site of the Temple of Solomon close to the Church of the Holy Sepulcher. Hence they took their name as Templars (*pauperes commilitones Christi templique Salomonici*), and the houses of the order, as at Paris and London, that of the Temple. At the Council of Troyes (1128) Bernard of Clairvaux drew up its rule in 72 statutes, substantially the groundwork of the statutes as finally revised in the middle of the 13th century. The order at first consisted of knights alone, but later its members were grouped as knights, all of noble birth, chaplains, and men-at-arms (*fratres servientes*), besides mercenaries, retainers, and craftsmen affiliated, and enjoying its protection. The knights took the vows for life or for a certain period, and they alone wore the white linen mantle, with the eight-pointed red cross on the left shoulder (granted by Pope Eugenius III.), and white linen girdle; black or brown garments were worn by all others. The seal of the order showed the Temple, later two riders — a Templar and a helpless pilgrim — on one horse.

The discipline of the order was austere, excluding all needless luxury or display in food, dress, or armor, and all worldly pleasures were forbidden — hawking and hunting all animals, with the characteristic exception of the lion. Married brethren were admitted, but no woman might enter the order, and all brethren were enjoined to shun the kiss of woman, even of mother or sister. The beard was worn, the hair cut short, and all slept alone in shirt and breeches, with a light constantly burning. At the head of the whole order stood the Grand-master; under him Masters, Grand Priors, Commanders, or Preceptors ruled the various provinces of Jerusalem, Tripoli, Antioch and Cyprus, Portugal, Castile and Leon, Aragon, France and Auvergne, Aquitaine and Poitou, Provence, England, Germany, Italy (Middle and Upper), Apulia and Sicily. Second in command to the Grand-master stood the Seneschal, his deputy; next the Marshal, whose business, moreover, was to provide arms, horses, and all the material of war. Visitors-general conveyed the commands of the Grand-master and convent or chapter of Jerusalem to the various provinces, exercised discipline, and settled disputes. The Prior or Preceptor of the kingdom of Jerusalem, also styled Grand-preceptor of the Temple, was also general treasurer of the order. The Drapier had general charge of the clothing; the Standard-bearer (*balcanifer*), bore the glorious *bauseant* or war banner (half black and half white, with the legend, "*Non nobis, non nobis, Domine, sed nomini tuo da gloriam,*" ("Not to us, not to us, but to thy name, Lord, be the glory") to the field; the Turcopilar commanded the Turcopoles, a body of light horse, natives of Syria and Palestine, in the pay of the order; the Guardian of the Chapel (*custos capellæ*) had charge of the portable chapel and the appurtenances of the altar, always carried into the field. The Templars were by a papal bull in 1172 rendered independent of the authority of the bishops, owning allegiance to the Pope alone, the immediate bishop of the entire order; and, moreover, they were allowed to have chaplains within their own ranks to whom they might confess, to erect oratories for divine worship within their bounds, and to enjoy exemption from all taxes and tithes, and from interdict. Their houses enjoyed right of sanc-

Templars

tuary, and they often preserved the treasure of kings and nobles.

The Templars, at once knights and monks, realized the two dearest of mediæval ideals, and men of the highest courage and purest devotion flocked into their ranks, bringing with them their wealth to fill their coffers. Already by 1260 the order is said to have numbered 20,000 knights, and these perhaps the finest fighting men the world has seen. Never in the history of the world did men fling away their lives more gloriously for a hopeless cause; never did a Templar play the coward in the hour of danger, or, when all hope was lost, barter his soul to a Moslem conqueror in return for his life. Charges of pride, of immorality and impieties, of secret heresies, and even of betraying Frederic II. to the infidel (1229) and St. Louis to the Soldan of Egypt (1250) were yet to be hurled against the order; never, from the beginning to the end of their two centuries of history, was a Templar charged with cowardice before the enemy. It was their proud boast that 20,000 of their number perished for the cause in Palestine; of their 22 Grand-masters seven died on the field of battle, five of their wounds, one of voluntary starvation a prisoner in the hands of Saladin. The most famous successors of Hugues de Payen (died 1136) were Bernard de Tremelai, who fell at Ascalon in 1153; Eudes de Saint-Amand (died 1179), who won a glorious victory over Saladin at Ascalon (1177), only to fall next year into the Sultan's hands after a disastrous battle; Gerard de Riderfort, who suffered a terrible defeat near Nazareth in 1187, a second at Hittin two months later, and died in battle under the walls of Acre in 1189; Robert de Sable, who aided Richard Cœur de Lion to gain a glorious victory in the plain of Arsouf (1191), and bought from him the island of Cyprus, which was soon transferred to Guy de Lusignan, whereupon Acre became the seat of the order, the famous stronghold of Pilgrim's Castle being built, whose stupendous ruins exist to this day; Peter de Montaigu, whose courage helped to take Damietta in 1219; Hermann de Perigord, who rebuilt the fortress of Safed; Guillaume de Sonnac, slain beside St. Louis at the Nile in 1250; Thomas Berard, an Englishman, under whom Safed was lost in 1266, Jaffa and Antioch in 1268; and Guillaume de Beaujeu, who lost Tripoli in 1290, and fell in the bloody capture of Acre in 1291. The remnant of the Templars sailed to Cyprus, and the lastest dying gleams of the order's vigor in the East were the rash attempts to capture Alexandria (1300), and to establish a settlement at Tortosa (1300–1302) under the last and most ill-fated of its grand-masters.

The Templars had failed in their work; their usefulness was past; the order had now only to sink into extinction in one of the darkest tragedies of history. Their wealth and pride had sowed a harvest of fear and hatred; their loyalty to the Pope and their exceptional privileges had long since aroused the jealousy of the bishops; their bitter quarrels with the Hospitallers, which blazed into open warfare in Palestine in 1243, had shocked the moral sense of Christendom; and the exclusiveness and secrecy with which all their affairs were conducted opened a door for all manner of sinister suspicions among the populace. Philip the Fair of France was a king who covered with a thin veneer of piety a character of complete unscrupulousness; he had succeeded in placing Clement V., a miserable creature of his own, on the papal throne (1305), and in his minister Guillaume de Nogaret and the officers of the Inquisition he found servants of character unscrupulous as his own. His unfortunate Flemish wars had brought him into desperate financial difficulties, and his treasury was now completely exhausted in spite of extortionate taxation, a shameful debasement of the currency, and the merciless plunder of the Jews and the Lombard bankers. In the wealth of the Templars he saw a tempting prize, and the train of treachery was soon complete.

Doubtless their numbers and even their wealth are enormously exaggerated by historians; Schottmüller assumes that in France alone there were 15,000 brethren, and over 20,000 in the entire order; Mr. Lea thinks that at the end there may have been as many as 1,500 knights. The Grand-master Jacques de Molay, was summoned from Cyprus by the Pope in 1306; he went taking with him the treasure of the order, and awaited his fate in France. On Oct. 13, 1307, which Döllinger in one of his lectures calls an outstanding *dies nefastus* in human history, the Grand-master and 140 Templars were seized at the Temple and flung into prison. Two degraded Templars supplied some of the charges the king required; tortures, infamous beyond the infamies of the Inquisition, provided the remainder. A habitual denial of Christ, spitting on the cross, the worship of hideous images, travesty of the holy communion and of the sacrifice of the mass, sorceries, unnatural lusts, *oscula inhonesta* and other indecencies — such were the confessions suggested to and wrung from men racked by the agonies of inhuman tortures to which as many as 36 knights succumbed in Paris alone. In August, 1308, Clement sent throughout Christendom the 127 articles of interrogation for the accused, and evidence in detail self-contradictory beyond all parallel was quickly accumulated. In the 225 witnesses sent to the papal commission (1310–1311) from various parts of France the depositions, as Mr. Lea points out, occur most suspiciously

in groups of identity according to the bishops from whose preliminary tribunals they had come.

Philip held a so-called national assembly at Tours (May 1308) which obsequiously expressed its approval of the condemnation. The Pope now took the formal responsibility upon himself by personally examining 72 Templars brought before him, when those who had already confessed under torture confirmed their confessions, knowing well that the penalty of retraction was burning forthwith as a relapsed heretic. The Pope contended that the fate of the order as an institution must be submitted to a general council. Meantime, to the public commission appointed to examine into the charges at Paris, to give the order an opportunity of being heard in its defense, and to report there came (March, 1310), as many as 546 Templars who offered to defend the order against all the charges — blunt, unlearned soldiers, deprived of their chiefs, and weak with torture, long imprisonment, cold and hunger. Four of these were at length commissioned to be present at the investigation on behalf of the order, when suddenly the commission was startled by the news that the provincial council of Sens was about to sentence without further hearing those Templars who had offered to defend the order as relapsed heretics in regard to their former confessions. On May 12, 1310, 54 knights were slowly burned to death, refusing in the midst of the most awful agonies to perjure themselves by false confessions.

The commission at once suspended its sittings, but at length, after many delays, on June 5, 1311, transmitted its report to Clement to help the General Council in its deliberations. The closing act in this dreary and tangled drama of papal duplicity was Clement's failure to gain over the Council at Vienne, and the suppression of the order without formal condemnation, by the bull "Vox in excelso" (March 22, 1312). The bull "Ad providam" (May 2) laid it under perpetual inhibition, and transferred its property to the Hospital of St. John of Jerusalem. The persons of the Templars were handed over to the provincial councils, with the exception of the chiefs of the order, who were reserved to the jurisdiction of the Holy See — a vain hope for which they had left their inferior brethren to their fate. At length, on March 19, 1314, Jacques de Molay and the gray-haired Geoffrey de Charney, Master of Normandy, were brought from prison to receive judgment, when, to the dismay of the churchmen and the astonishment of all, they rose and solemnly declared their innocence and the blamelessness of the order. That same day, on the Isle des Juifs in the Seine, they were slowly roasted to death, declaring with their last breath that the confession formerly wrung from them by torture was untrue. A strange tradition asserts that from the stake the Grand-master summoned both the Pope and the king to meet him at the bar of Almighty God within a year, and history tells us that within a year both went to their account.

In England the trials were conducted with much less inhumanity, and it was only direct pressure from the Pope that persuaded the king to permit torture to be applied. The charges for the most part failed to be established, and most of the prisoners were granted penances and permitted to escape with a formal abjuration, while a fair provision was made for their support. The last Master of the Temple in England, William de la More, died a prisoner in the Tower, to the last maintaining the innocence of the order. The memory of the various preceptories and possessions in England, Scotland, and Ireland survives in place names; the round Temple Church in London, consecrated in 1185, was restored by the Benchers of the Inner and Middle Temple (1839–1842) at a cost of $250,000. In Spain, Portugal, and Germany the order was found innocent; almost everywhere in Italy, save in the case of six at Florence, the charges broke down. Everywhere the larger part of their property was given to the Hospitallers, and even in France the king was in great part forced by public opinion to forego his prey.

Temple, an edifice erected and dedicated to the service of some deity or deities, and connected with some pagan system of worship. The term is generally applied to such structures among the Greeks, Romans, Egyptians, and other ancient nations, as well as to structures serving the same purpose among modern heathen nations. Among all ancient nations the usual plan of a temple was rectangular, seldom circular. Among the Greeks rectangular temples were classed in forms, according to their architectural peculiarities, viz.: (1) The temple in antis, in which the pteromata, or ends of the side walls, project so as to form plaster-like piers called antæ, between which are columns, generally two in number. (2) The prostyle, in which the pronaos, or porch, is formed in it entire breadth by a disposition of columns, generally four in number, so that the corner columns stand in front of the antæ, with an intervening space. (3) The amphiprostyle, in which both the front and back of the temple have the prostyle arrangement. (4) The peristyle or peripteral, surrounded by columns on all sides, in which the front and back frequently have double rows of columns, and are both hexastyle. (5) The pseudoperipteral, occurring extremely rarely in Grecian architecture, in which the peripteral is imitated by col-

Temple

umns attached to the walls. (6) The dipteral, surrounded by a double colonnade, with porticoes of from 8 to 10 columns in front. (7) The pseudodipteral, which rarely occurs, is a dipteral with the inner range of columns omitted throughout. The circular temples were of three kinds: (1) The most usual was the peripteral, which had a circular cella, or cell, surrounded by a colonnade. (2) The monoptoral, which was an open circle of columns supporting a roof or entablature, and consequently without a cella. (3) The pseudoperipteral, in which, as in the oblong pseudoperipteral, the columns were attached to the walls of the cella.

These circular temples, which are far from common, and in which Corinthian columns are usually employed, were, for the most part, intended for the worship of Vesta. A further distinction was made in temples according to the number of columns in front; this number, however, was always an even one. They are called tetrastyle, hexastyle, octastyle, decastyle, etc., according as they had 4, 6, 8, 10, etc., columns. Among the Etruscans the form of the temples differed from the Grecian the ground plan more nearly aproaching a square, the sides being in the proportion of five to six. The interior of these temples was divided into two parts, the front portion being an open portico resting on pillars, while the back part contained the sanctuary itself, and consisted of three cellæ placed alongside one another. The inter-columniation was considerably greater than in Grecian temples. Among the Romans a temple, in the restricted sense of an edifice set apart for the worship of the gods, consisted essentially of two parts only — a small apartment or sanctuary, the cella, sometimes only a niche for receiving the image of the god, and an altar standing in front of it, upon which were placed the offerings of the suppliant. The general form — whether circular, square, or oblong; whether covered with a roof, or open to the sky; whether plain and destitute of ornament, or graced by stately colonnades with elaborately sculptured friezes and pediments — depended entirely upon the taste of the architect and the liberality of the founders, but in no way increased or diminished the sanctity of the building. In so far as position was concerned, a temple, whenever circumstances permitted, was placed east and west, the opening immediately opposite to the cella being on the west side, so that those who stood before the altar with their eyes fixed upon the god, looked toward the east. The most celebrated temples of the ancients were those of Jupiter Olympus in Athens, of Diana (or Artemis) at Ephesus, of Apollo at Delphi, and of Vesta at Tivoli and Rome.

It is also an edifice erected among Christians as a place of public worship; a church; and the name of two semi-monastic establishments of the Middle Ages — one in London, the other in Paris — inhabited by the Knights Templar. The Temple Church in London is the only portion of either now existing. On the site of the London establishment have been erected the two Inns of Courts known as the Inner and Middle Temples, which are occupied by barristers, and are the property of two societies called the Societies of the Inner and of the Middle Temple, who have the right of calling persons to the degree of barrister.

Temple, Solomon's, the building reared by Solomon as a habitation for Jehovah, though the king was aware that God could not be confined to an earthly edifice, or even to the heaven of heavens (I Kings viii: 27). David had planned the Temple, but was divinely forbidden to erect it, as he had shed so much blood in his wars (I Chron. xxii: 8). He, however, made great preparations for his son and successor, who, he learned from the prophet Nathan (II Sam. vii: 13), was destined to achieve the work. It was but on Mount Moriah (II Chron. iii: 1), chiefly by Tyrian workmen, and had massive foundations. Its dimensions were 60 cubits (90 feet) long; 20 cubits (30 feet) wide, and 30 cubits (45 feet) high. The stone for its erection was dressed before its arrival, so that the edifice arose noiselessly (1 Kings vi: 7); the floor was of cedar, boarded over with planks of fir; the wainscoting was of cedar, covered with gold, as was the whole interior. It was modeled inside on the tabernacle, which was Jehovah's appropriate dwelling while journeyings were continually taking place, as the Temple was now that these had ceased. There was therefore a Holy and Most Holy Place. The Temple was surrounded by an inner court for the priest. There was also a Great or Outward Court (II Chron. iv: 9; Ezek. xl: 17), called specially the Court of the Lord's House (Jer. xix: 14. xxvi: 2). This temple was destroyed by the Babylonians during siege of Jernsalem under Nebuchadnezzar (II Kings xxv: 9; II. Chron. xxxvi: 19). On the return from Babylon, a temple, far inferior to Solomon's, was commenced under Zerubbabel, B. C. 534, and, after a long intermission, was resumed B. C. 520, and completed B. C. 516, under Darius Hystaspes (Ezra iii: 7, vi: 15). The second temple was gradually removed by Herod, as he proceeded with the building or rebuilding of a temple designed to rival the first rather than the second. The work was commenced B. C. 21 or 20; the temple itself was finished in about a year and a half, the courts in eight years, but the subsequent operations were carried on so dilatorily that the Jews reckoned 46 years as the whole time con-

sumed (John ii: 20). In the courts of this temple Jesus preached and healed the sick. It caught fire during the siege of Jerusalem under Titus, and notwithstanding his efforts to save it, was burned to the ground.

Temple, Frederick, an English clergyman; born in Leukas, in the Ionian Islands, Nov. 30, 1821; was educated at Tiverton and at Balliol College, Oxford, where in 1842 he graduated double-first; and was subsequently fellow and tutor of his college. Successively principal of Knellar Hall Training College, inspector of schools, and headmaster of Rugby, he became conspicuous in the theological world in 1860, as author of the first of the "Essays and Reviews." In 1868–1870 he supported the disestablishment of the Irish Church, and was in 1869 consecrated Bishop of Exeter — a Broad Church successor to the High Church Dr. Phillpotts — in spite of strong clerical opposition. He proved an admirable administrator, and in 1885 was promoted to the see of London. His "Sermons Preached in Rugby Chapel" appeared in 1861; and in 1896 was made archbishop of Canterbury. He died Dec. 23, 1902.

Temple, Oliver Perry, an American lawyer; born in Green co., Tenn., Jan. 27, 1820; was graduated at Washington College, Tenn., in 1844, and was admitted to the bar in 1846. President Fillmore made him a commissioner to visit the Indian tribes of New Mexico, Arizona, and California in 1850. Prior to and during the Civil War he was one of the Union leaders in Eastern Tennessee. He was chancellor of Tennessee in 1866–1878; retired from practice in 1881; and was postmaster of Knoxville, Tenn., in 1881–1885. His publications include "The Covenanter, The Cavalier and the Puritan" (1897); and "East Tenessee and the Civil War" (1899). He died in 1907.

Temple, Sir Richard, an English diplomatist; born in Kempsey, near Worcester, England, in 1826; was educated at Rugby; went to India as secretary to the chief commissioner of the Punjab in 1848; became lieutenant-governor of Bengal in 1874; and was governor of Bombay in 1877–1880. He was made a baronet in 1876; was vice-chairman of the London School Board; and a member of Parliament in 1885–1895. He was the author of "India in 1880"; "Men and Events of my Time in India"; "Oriental Experience"; "Cosmopolitan Essays"; etc. He died in London, England, March 17, 1902.

Temple, Richard Grenville, Earl, an English statesman; born in England, Sept. 26, 1711; is mainly known as having from 1752 to 1761 held office under the elder Pitt, who had married his sister; as having bitterly opposed Bute; and as having broken with Pitt (Chatham) on the question of the Stamp Act in 1766, soon after which time he ceased to take any prominent part in public affairs. He died in Stowe, England, Sept. 11, 1779.

Temple, Sir William, an English statesman; born in London, in 1628; was educated at Emanuel College, Cambridge. He afterward passed six years in France, Holland, Flanders, and Germany. On his return (1654), not choosing to accept office under Cromwell, he occupied himself in the study of history and philosophy. After the Restoration (1660) he was nominated one of the commissioners from the Irish Parliament to the king. On the breaking out of the Dutch war (1665) he was employed in a mission to the Bishop of Münster, who offered to attack the Dutch, and in the following year was appointed resident at Brussels, and received the honor of a baronetcy. In conjunction with DeWitt he concluded the treaty between England, Holland, and Sweden (Triple Alliance, 1668), the result being to oblige France to restore her conquests in the Netherlands. He also attended, as ambassador extraordinary, when peace was concluded between France and Spain at Aix-la-Chapelle (1668), and subsequently residing at The Hague as ambassador, became familiar with the Prince of Orange, afterward William III. Recalled in 1669, Sir William remained in retirement at Sheen till 1674, when he was again ambassador to the States-General, and engaged in the Congress of Nimeguen, by which a general pacification was latterly effected, 1679. He was instrumental in promoting the marriage of the Prince of Orange with Mary, eldest daughter of the Duke of York (James II., 1677). Shortly after his return he was elected to represent the University of Cambridge in Parliament. In 1681 he retired from public life altogether. Swift was an inmate of his house for some time. His Memoirs and Letters are especially interesting to the student of history. His Miscellanies consist of essays on various subjects: "Gardening," "The Cure of the Gout," "Ancient and Modern Learning," "Health and Long Life," "Poems and Translations," etc. He died in Moor Park, Surrey, Jan. 27, 1699.

Temple, William Greenville, an American naval officer; born in Rutland, Vt., March 23, 1824; was graduated at the United States Naval Academy in 1846; entered the navy as midshipman in 1840; served with distinction in the Mexican War, being present at the bombardment and surrender of Vera Cruz and the engagements at Alvarado, Tuspan, and Tabasco. He was on duty at the United States Naval Observatory in 1848; engaged in surveying the Florida reefs and the Gulf stream in 1848–1850; had charge of the surveys and hydrographic work for the projected canal and

railroad across the Isthmus of Tehuantepec in 1850–1852; and was on coast survey duty in 1852–1859. He was promoted master in 1854, and lieutenant in 1855. He served throughout the Civil War, taking part in the attack on Fort Fisher and the capture of Petersburg, Wilmington, and Richmond. He was promoted commander in 1865, captain in 1870, commodore in 1878, and rear-admiral Feb. 22, 1884, and was retired the following week. He died in Washington, D. C., June 28, 1894.

Temple Bar, a London gateway, dividing Fleet Street from the Strand, the city from the shire. Rebuilt after the great fire by Wren in 1669–1673 at a cost of $6,990, it was removed in 1878–1879, and reërected in Theobalds Park, Cheshunt, in 1888. Its site is marked by a memorial, surmounted by a griffin, and erected in 1880 at a cost of $57,750.

Temple Society, a body of German Christians who wait for the second coming of Christ. They separated from the Church in Würtemberg and formed a separate sect; and many of them settled in Palestine in 1868, where they now have colonies at Haifa, Jaffa, Sarona, and near Jerusalem, distinguished for industry, enterprise and success. There may be about 5,000 in all of the community, of whom about 1,300 are in Palestine.

Templet, a pattern or mold used by masons, machinists, smiths, shipwrights, etc. It usually consists of a flat thin board, a piece of sheet iron, or the like, whose edge is dressed and shaped to the required conformation, and is laid against the object being molded, built, or turned so as to test the conformity of the object thereto.

Templin Oil, oil of pine cones; obtained by distilling the cones of the silver fir or of *Pinus pumilis*. It is colorless, but becomes greenish-yellow on exposure to the air, has an odor of lemons, sp. gr. 0.862 at 12°, and boils between 155° and 200°, the greater part distilling over about 175°. It agrees with oil of turpentine in its solubility and refracting power.

Tempo, in music, a word used to express the rate of movement or degree of quickness with which a piece of music is to be executed. The degrees of time are indicated by certain words such as *lento* (slow), *adagio* or *largo* (leisurely), *andante* (walking pace), *allegro* (gay or quick), *presto* (rapid), *prestissimo* (very rapid), etc.

Temporal Bone, in anatomy, a bone articulating posteriorly and internally with the occipital bone, superiorly with the parietal, anteriorly with the sphenoid, the malar, and the inferior maxillary bone. It constitutes part of the side and base of the skull, and contains in its interior the organ of hearing. It has a squamous, a mastoid, and a petrous portion.

Temporal Fascia, in anatomy, a dense white, shining aponeurotic structure covering the temporal muscle above the zygoma, and giving attachment to some of its fibers.

Temporal Fossa, in anatomy, the upper portion of the space bridged over by the zygomatic or malar arch.

Temporal Power, the power which the Pope exercised as sovereign of the States of the Church. Pius VII. was partially deprived of his dominions by Napoleon I. in 1797, and entirely in 1808. The Pope replied by a bull of excommunication; he was then arrested and kept a close prisoner in France till the fall of Napoleon in 1814, when he was reinstated in the government of an undiminished territory. The temporal power was again attacked in 1848, when Pius IX. was driven from Rome, and a republic was established by Mazzini and Garibaldi. In 1849 General Oudinot was sent by Louis Napoleon, president of the French Republic, to Rome, and his army drove out the revolutionists and brought the Pope back. For 10 years the Pope's power was not attacked, but Cavour (1809–1861) was working steadily for a "United Italy," and in 1870 Victor Emmanuel, King of Italy, took possession of the papal territory, leaving the Pope only the Vatican. An annual dotation of 2,000,000 lire was guaranteed to him by the Italian Parliament, but he never accepted it. Also, the power exercised by the Popes in the Middle Ages of excommunicating, and after excommunication deposing or procuring the deposition of a sovereign who had fallen into heresy. According to Addis & Arnold:

> "The common opinion teaches that the Pope holds the power of both swords, the spiritual and the temporal, which jurisdiction and power Christ himself committed to Peter and his successors (Matt. xvi: 19). . . . The contrary opinion is held to savor of heresy."

But they add:

> "The state of Europe is so much altered . . . that there is no longer any question, even at Rome, of exercising the deposing power."

Temporary Star, a star appearing for a time, and then gradually vanishing away. In November, 1572, a star burst out in Cassiopeia with a brilliancy greater than that of any one near it, Tycho Brahe being one of those who observed it at the time. It rapidly increased in magnitude till it outshone Sirius and Jupiter, and became visible even at noon. Then it diminished in size, and in March, 1574, became invisible to the naked eye, nor has it been seen since. During its brief life it shone first white, then yellow, then reddish, and finally bluish. La Place though the reason of its temporal visibility was the bursting out within it of fire.

Temryuk, a fortified town of South Russia, in the Kuban district of the Caucasus; on a peninsula on the S. side of the Sea of Azov, in the bay of Temryuk. **Pop.** about 20,000.

Tenacity, that property of material bodies by which they are able to resist a severe strain without rupturing or splitting; that quality of material bodies by which their parts resist an effort to force or pull them asunder; the measure of the resistance of bodies to tearing or crushing; opposed to brittleness or fragility. Tenacity results from the attraction of cohesion existing between the particles of bodies, and is directly proportional to it. It consequently varies in different substances, and even in the same material under varying conditions as regards temperature. The resistance offered to tearing is called absolute tenacity, that offered to crushing, retroactive tenacity. The processes of forging and wire-drawing increase the tenacity of metals longitudinally, and the tenacity of mixed metals is generally greater than that of simple metals. The tenacity of wood is greater in its longitudinal direction than in a transverse direction. The method of ascertaining the tenacity of particular bodies is to form them into cylindrical or prismatic wires, and note the weight required to break them. It is directly proportional to the breaking weight, and inversely proportional to the area of a transverse section of the wire.

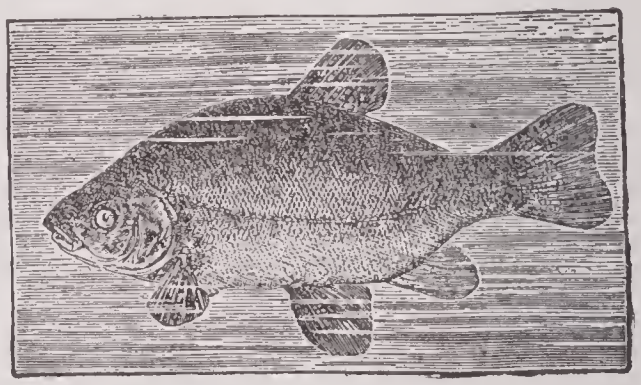
Tenail, or **Tenaille,** in fortification, an outwork or rampart raised in the main ditch immediately in front of the curtain between two bastions, in its simplest form having two faces constituting a reëntering angle.

Tenant, in law, one who occupies, or has temporary possession of lands or tenements, the titles of which are in another, the landlord. A "tenant at will" is one who occupies lands or tenements for no fixed term other than the will of the landlord. A "tenant in common" is one who holds lands or tenements along with another or other persons. Each share in the estate is distinct in title, and on the death of a tenant his share goes to his heirs or executors. A "tenant for life" (in Scotland, a "life-renter") is one who has possession of a freehold estate or interest, the duration of which is determined by the life of the tenant or another. An estate for life is generally created by deed, but it may originate by the operation of law, as the widow's estate in dower, and the husband's estate by courtesy on the death of his wife.

Tenant Right, a term specifically applied to an Irish custom, long prevalent in Ulster, either ensuring a permanence of tenure in the same occupant without liability to any other increase of rent than may be sanctioned by the general sentiments of the community, or entitling the tenant of a farm to receive purchase money amounting to so many years' rent on its being transferred to another tenant; the tenant having also a claim to the value of permanent improvements effected by him. In course of time the advantages of tenant right granted to the Ulster farmers were claimed by the farmers in the other provinces of Ireland, and the custom spread to a considerable extent. At last, under the management of Gladstone and Bright, the Landlord and Tenant Act of 1870 was passed. By it the Ulster tenant right and other corresponding customs received the force of law, and the outgoing tenant became entitled to compensation from the proprietor to an amount varying according to circumstances. The act contained other provisions giving compensation for improvements, but as it did not succeed in doing away with all grievances a fresh bill was prepared and passed under the name of the Land Law Act, 1881, which established a land commission to revise rents, and to fix them for 15 years. This measure has been amended by subsequent acts.

Tenasserim, a territory in India, acquired by Great Britain after the war in 1825; the S. division of Burma; is a long narrow strip between the sea and the mountains of the Siamese frontier; area, 46,590 square miles; pop. 971,660. There are seven districts — the town of Maulmain, Taung-ngu, Schwe-gyin, Salwen, Amherst, Tavoy, and Mergui; the chief towns being Maulmain Taung-ngu, and Tavoy. The town of Tenasserim, which has, through wars and other misfortunes, sunk to be a village of only 577 inhabitants, is 33 miles from the sea at the junction of the Great and Little Tenasserim rivers, the former of which has a total course of about 400 miles.

Tench, in ichthyology, *Tinca tinca,* the sole species of the genus, found all over Europe in stagnant waters with soft bot-



A TENCH.

tom. Like most other carps of the group *Leuciscina,* it passes the winter in a torpid state, concealed in the mud. Tench

have been taken three feet long, but one of half that size is unusually large. They breed in May and June, depositing the spawn among aquatic plants; the ova are small, and exceedingly numerous, as many are 297,000 having been counted in a single female. The flesh is naturally soft and insipid, but if the fish are fed on meal, it becomes delicate and well-flavored. The color is usually deep yellowish-brown, and the so-called golden tench is not a distinct species, but a variety displaying incipient albinism.

Tencin, Madame de (CLAUDINE ALEXANDRINE GUÉRIN), a French author; born in Grenoble in 1681; entered the religious life; but soon found its restraints intolerable. Finally, in 1714, she went to Paris, where her wit and beauty soon attracted to her a crowd of lovers, among them personages as great as the Regent and Cardinal Dubois. She had much political influence, was a bitter enemy of the Jansenists, enriched herself, and helped the fortunes of her brother the Cardinal Pierre Guérin de Tenchin (1680–1758). But her importance died with the regent and the cardinal in 1723. In 1726 she lay a short time in the Bastille, after the tragic scandal caused by one of her lovers shooting himself in her house. Her later life was most decorous, and her salon became one of the most popular in Paris. One of her oldest lovers was Fontenelle; D'Alembert was one of her children. Her romances, "Memoirs of the Courte de Comminges" (1735), "The Siege of Calais" (1739), and "The Misfortunes of Love" (1747), show taste, passion, and style, with all the 18th century limitations. They resemble the romances of Madame de La Fayette in many points, but they lack the peculiar charm that lives in everything written by that admirable woman. Madame de Tencin's "Correspondence" with her brother appeared at Paris in 1790; the "Letters to the Duc de Richelieu" in 1806. She died in Paris, Dec. 4, 1749.

Tender, in law, an offer of money or other thing in satisfaction of a debt or liability. Legal tender, coin or paper money, which, so far as regards the nature and quality thereof, a creditor may be compelled to accept in satisfaction of his debt. In this country gold and silver coin are a legal tender to any amount, so far as a debt admits of being paid in gold or silver; and national treasury notes or greenbacks are also legal tender. Plea of tender, in law a plea by defendant that he has been always ready to satisfy the plaintiff's claim, and now brings the sum demanded into court. Tender of amends, in law, an offer by a person who has been guilty of any wrong or breach of contract to pay a sum of money by way of amends.

Tender, a small vessel appointed to attend a larger one, and employed for her service in procuring stores, etc. In railways a tender is a carriage attached to the locomotive for carrying the fuel, water, etc.

Tender Porcelain, a ware composed of a vitreous frit rendered opaque and less fusible by addition of calcareous clay. Its glaze is a glass of silica, alkali, and lead.

Tendon, the white fibrous tissue reaching from the end of a muscle to bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. Tendons have been divided into (1) Funicular, or rope-like, as the long tendon of the biceps muscle of the arm. (2) Fasicular, as the short tendon of that muscle and as the great majority of tendons generally. (3) Aponeurotic or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles. The tendons commence by separate fasicles from the end of each muscular fiber, and they similarly terminate by separate fasicles in distinct depressions in the bones, besides being closely incorporated with the periosteum. In some birds whose tendons are black the periosteum is black also. If a tendon is ruptured by an accident, or divided by the surgeon (tenotomy), the two ends, if not too far separated, unite with extreme readiness, by the formation of intervening plastic material, which soon acquires great firmness. The tendons most frequently ruptured are the ACHILLES TENDON (*q. v.*), and the tendons of the rectus femoris and the triceps humeri.

Among the diseases of tendons are inflammation and one of the forms of whitlow known as paronychia gravis, or tendinous whitlow, in which the "tendons and their sheaths in the finger and hand are the seat of a severe and often most destructive inflammation, which though often confined to one finger, not unfrequently extends to the hand and arm, attacking not only the tendons and softer parts, but exposing the bones and disorganizing the joints" (Holmes). A permanently bent finger, from adhesion of the tendon to its sheath, is a common result in severe cases of whitlow of this kind. Tendons may also be inflamed as the result of gout or rheumatism, and not very unfrequently they are the seat of syphilitic enlargements or other tumors. Fibrous tumors and small cartilaginous enlargements are often found in tendons.

Tendon Phenomena, in physiology, the action of certain muscles, due apparently to reflex action produced by afferent im-

pulses started in the tendon, but really to direct stimulation of the muscles themselves. Thus, when the leg is placed in an easy position (for example, resting on the other leg), a sharp blow on the patellar tendon will cause a sudden jerk forward of the leg, produced by the contraction of the *quadriceps femoris* muscle.

Tendotome, in surgery, a subcutaneous knife, having a small oblanceolate blade on the end of a long stem, and used for severing deep-seated tendons without making a large incision or dissecting down to the spot.

Tendrac, in zoölogy, a small insectivorous mammal, from Madagascar, allied to the tanrec, but separated on account of its dentition, and given generic rank under the name *Ericulus.* It is about two-thirds the size of the common hedgehog, which it closely resembles in appearance. Its general tint is dusky, the spines being black, tipped with white or light red. Telfair's tendrac, with the same habitat, constitutes another genus, *Echinops,* differing from *Ericulus* in dentition. It is about five inches long, brownish above, dingy white beneath, the upper surface closely covered with sharp spines.

Tendril, in botany, a curling and twining thread-like process by which one plant clings to another body for the purpose of support. It may be a modification of the midrib, as in the pea; a prolongation of a leaf, as in Nepenthes; or a modification of the inflorescence, as in the vine. They have been divided into stem tendrils and leaf tendrils. Called also cirrhus, and by the old authors capreolus and clavicula. Linnæus included tendrils under his fulcra. Tendril-bearing plants are distributed among 10 orders. Darwin ("Origin of Species") points out that the gradations from leaf climbers to tendril bearers are wonderfully close, and that in each case the change is beneficial to the species in a high degree.

Tenebræ, the office of Matins and Lauds for the Thursday, Friday, and Saturday in Holy Week, sung on the afternoon or evening of Wednesday, Thursday, and Friday respectively. The Gloria Patri, hymns, antiphons of the Blessed Virgin, etc, are omitted in token of sorrow. At the beginning of the office, 15 lighted candles are placed on a triangular stand, and at the conclusion of each psalm one is put out, till a single candle is left at the top of the triangle. While the Benedictus is being sung, the lights on the high altar are extinguished, and then the single candle is hidden at the Epistle side, to be brought out at the conclusion of the office. The extinction of the lights (whence the name tenebræ) is said to figure the growing darkness of the world at the time of the Crucifixion, and the last candle is hidden for a time to signify that death could not really obtain dominion over Christ, though it appeared to do so. A noise is made at the conclusion of the office to symbolize the convulsions of nature at the death of Christ (Matt. xxvii: 45, 50–53; Mark xv: 33, 37, 38; Luke xxiii: 44, 45).

Tenebrionidæ, in entomology, a family of heteromerous beetles, tribe Atrachelia. Body usually oval or oblong, depressed; thorax square or trapezoid, the same breadth as the extremity of the abdomen; last joint of the maxillary palpi formed like a reversed triangle or hatchet; mentum but little extended, leaving the base of the jaws uncovered. Black or dull-colored insects, with a peculiar odor, slow in their movements and nocturnal in their habits. A few aberrant species are found on trees and plants. They feed generally on decaying animal and vegetable matter. Most of the hard species are very tenacious of life. Some are mimetic, resembling carabidæ, longicornes, etc. About 5,000 species are known. The larger number are found along the margins of deserts in the Old and New World. Genera: *Blaps, Tenebrio,* etc.

Tenedos, an island of Asiatic Turkey, on the W. coast of Asia Minor; 15 miles S. W. of the Dardanelles, about 6 miles long and 3 miles broad. The channel which separates it from the mainland is 3 miles broad. The interior of the island is very fertile, and is remarkable for the excellence of its wines. Corn, cotton, and fruits are also produced. On the E. side of the island, near the sea, is the town of Tenedos.

Tenement House, a house divided into tenements occupied by separate families. In tenement houses the landlord does not usually reside on the premises. In most large cities of the United States, owing to the exorbitantly high price of land whereon to build, the policy has obtained of building houses containing apartments to accommodate (or contain) as many persons as can be crowded into them. These apartments are let by the landlord either in suites or by the single room, and here are massed together, usually surrounded by squalor and filth, many individuals of the poorer classes. Owing to their crowded condition these houses present problems of sanitation impossible of solution, and are breeding places of disease and nurseries of plagues in times of epidemics. In some cities tenement houses are under police surveillance, but their existence presents one of the hardest questions of modern civilization.

Tenerife, Peak of, or **Pico de Teide,** a famous dormant volcano, the highest summit in the Canary Islands (*q. v.*), in the S. W. of the island of Tenerife. 12,200 feet above sea-level. The lower slopes of the

mountain are covered with forests, or laid out in extensive meadows, yielding rich grass; but the upper ridges and the peak, properly so called, are wild, barren, and rugged in appearance. The Peak El Piton and its two inferior neighbors, the Montana Blanco and Chahorra (9,880 feet), rise from a rugged circular plain of lava debris and pumice, 7,000 feet above sea-level, about 8 miles in diameter, and fenced in by an almost perpendicular wall of rock. From the crevices sulphurous vapors are constantly exhaling. The wall of the crater at the top is formed of broken and jagged porphyritic lava rocks, is elliptical, 300 feet in diameter, and 70 deep. The color of the whole is white. There is an ice cave at an altitude of 11,000 feet. The peak can be seen more than 100 miles off. In 1795 and 1798 there was volcanic activity here.

Tenesmus, a term employed in medicine to designate a continual inclination to void the contents of the bowels when no fœcal matter is present in the rectum, the straining being excited by some adjacent source of irritation of the muscles of the *sphincter ani,* produced generally by acrimonius substances. Tenesmus is a frequent symptom of dysentery, calculus, irritation of the bladder, stricture, etc. The treatment consists in the removal of the cause; and the local irritation may be relieved by the administration of an opiate enema, or a suppository containing morphia.

Tengmalm's Owl, the *Nyctala tengmalmi,* the common passerine or Tengmalm's owl, is deep brown, with a white throat, round brown spots on the breast and wings, and four white lines on the tail. It is scarcely larger than a blackbird.

Teniers, David, the name of two celebrated Dutch artists of the Flemish school, father and son, both natives of Antwerp, Holland, in which city the elder was born in 1582. Having studied under Rubens, he spent six years in Rome. On his return he occupied himself principally in the delineation of fairs, rustic sports, and drinking parties, which he exhibited with such truth, humor, and originality, that he may be considered the founder of a style of painting which his son afterward brought to perfection. His pictures are mostly small. He died in Antwerp, July 29, 1649. His son, born in Antwerp, Dec. 15, 1610, was taught painting by his father, whom he excelled in correctness and finish. He became highly popular, was appointed court painter to the Archduke Leopold William, governor of the Netherlands, and gave lessons in painting to Don John of Austria. He specially excelled in outdoor scenes, though many of his interiors are masterpieces of color and composition. His general subjects were fairs, markets, merry-makings, guard rooms, taverns, etc., and his pictures, which number over 700, are found in all the important public and private galleries of Europe. His etchings are also highly esteemed. He died in Brussels, Belgium, April 25, 1690.

DAVID TENIERS (THE YOUNGER).

Tenison, Thomas, an English clergyman; born in Cottenham, Cambridgeshire, Sept. 29, 1636, studied at Corpus Christi in Cambridge, and after holding several cures was made Bishop of Lincoln by William III. in 1691, and primate of all England three years later. He was a favorite at court, held many important state offices, and attended Mary and William on their death beds. He crowned Queen Anne and George I., being a strong supporter of the Hanoverian succession, and died Dec. 14, 1715.

Ten Kate, Jan Jacob Lodewijk, a Dutch poet; born in The Hague, Holland, Dec. 23, 1819. In 1836 his first volume of poems, entitled "Gedichten," appeared. In 1837, with a friend, he published a translation of the "Odes" of Anacreon, the first of a long series of translations that distinguished him among contemporaneous Dutch poets. Among these may be mentioned that of Byron's "Giaour"; Tasso's "Gerusalemme Liberata" (1856); Tegnér's "Frithiof's Saga" (1861); Schiller's "Marie Stuart" (1866); La Fontaine's "Fables"; Dante's "Inferno" (1876); Milton's "Paradise Lost" (1880). Among his original works are various collections of poems, and many treatises of a religious or philosophical character, some in prose: "Dead and Alive" (1856); "The Creation" (1860; English translation by Rev. D. Van de Pelt, 1888); "The Planets" (1869); "Eunoë" (1874); "Palm Leaves and Flowers of Poesy" (1884). Died in 1889.

Tennant, William, a Scotch poet; born in Anstruther, Fifeshire, May 15, 1784, studied for some time at the University of St. Andrews, was for several years a clerk, de-

voted himself then to teaching, and, being a good Oriental linguist, was in 1835 appointed to the chair of Oriental languages in St. Mary's College, St. Andrews. His chief production is "Anster Fair," a humorous poem of Scottish life in the same stanza as Byron's "Don Juan," which it preceded, being published in 1812. Besides "Anster Fair," Tennant was the author of several other poems and some dramas. None of them, however, attained any success. Grammars of the Syriac and Chaldee tongues were also published by him. He died near Dollar, Scotland, Feb. 15, 1848.

Tennantite (after the English chemist Smithson-Tennant), an isometric mineral, occurring mostly in crystals; hardness, 3.5–4; sp. gr., 4.37–4.53; luster, metallic, becoming very dull on long exposure to light; color, blackish-gray to iron-black; streak, dark-gray. Composition: A sulpharsenite of copper and iron, with the formula $4(Cu,Fe)S + As_2S_3$. The finest crystals have been hitherto found in the mines of Cornwall.

Tenne, in heraldry, a color, a kind of chestnut or orange-brown color. It is seldom used in coat armor. In engraving it is represented by diagonal lines, drawn from the sinister chief point, and traversed by horizontal ones.

Tennemann, Wilhelm Gottlieb, a German philosopher; born in Brembach near Erfurt, in 1761. His most important work is a "History of Philosophy" (11 vols. 1798–1819); he wrote also: "Doctrines and Opinions of the Disciples of Socrates on the Immortality of the Soul" (1791); "Plato's System of Philosophy" (4 vols. 1792–1794). He died in Marburg, Germany, Sept. 30, 1819.

Tennent, Sir James Emerson, an Irish statesman; born in Belfast, Ireland, April 7, 1804; was educated at Trinity College, Dublin, called to the bar in 1831, and elected in 1832 member of Parliament for his native town, which place he continued to represent till 1845, when he was returned for Lisburn. Meanwhile he had held under Peel the secretaryship of the Board of Trade. From 1845 to 1850 he was civil secretary to the government of Ceylon; in 1852 he was secretary to the Poor-law Board; and from 1852 to 1867 he held the post of secretary to the Board of Trade, on retiring from which he received a baronetcy. He was the author of several books of travel and other works, the most important being a valuable account of Ceylon (1859). He died in London, March 6, 1869.

***Tennessee,** a State in the South Atlantic Division of the North American Union; bounded by Kentucky, Virginia, North Carolina, Georgia, Alabama, Mississippi, Arkansas, and Missouri; admitted to the Union June 1, 1796; capital, Nashville; number of counties, 96; area, 42,050 square miles; pop. (1890) 1,767,518; (1900) 2,020,616; (1910) 2,184,789.

Topography.—Topographically Tennessee is divided into three sections, East Tennessee, an extensive valley, and agriculturally one of the most important sections of the State, stretches from the E. boundary to the middle of the Cumberland tableland, which has an average elevation of 2,000 feet above the sea, and abounds in coal, iron, and other minerals. Middle Tennessee extends from the dividing line on the table-land to the lower Tennessee river; and West Tennessee from the Tennessee river to the Mississippi. The Unaka Mountains, a part of the Appalachian chain, run along the E. boundary, and have an average elevation of 5,000 feet above the sea. The Mississippi, with the Tennessee and the Cumberland, drains three-fourths of the State. The two latter are navigable for a considerable distance, and other rivers with numerous tributaries supply valuable water power.

Geology.—The geological formations are varied. The Unaka range, the valley of E. Tennessee and the Central basin are almost entirely occupied by Lower Silurian deposits, and the table-land of the Cumberland, by the Carboniferous. The W. portion of the State is mostly Upper Silurian and Devonian, and the plateau W. of the Tennessee Cretaceous and Tertiary. The Mississippi river bottoms are of recent alluvial deposit.

Mineralogy.—The State is rich in its mineral resources, asbestos, kaolin, granite, copper, iron, manganese, barytes, clay, building stones, lead, and zinc being among the leading products. Coal measures occupy over 5,000 square miles in the Cumberland Mountain region. Limestone caves are found in many places, few having been explored. In 1900 the principal mineral productions were coal, 3,708,562 short tons, valued at $4,223,082; coke, 475,432 short tons, valued at $1,269,555; phosphate rock, 424,491 long tons, valued at $1,328,707; metallic paint, 5,983 short tons, valued at $40,050; mineral waters, 196,900 gallons, valued at $44,343; clay products, valued at $948,853; sandstone, $11,300; slate, $250; marble, $424,054; limestone, $238,505; red hematite, 283,784 long tons; and brown hematite, 310,387 long tons.

Agriculture.—The soil is exceedingly fertile, nearly every agricultural product thriving well, according to locality. The principal grain crops are Indian corn, wheat, and oats; and cotton, tobacco, flax, and hemp are extensively cultivated. The rearing and fattening of live stock are carried on under peculiar advantages, and immense numbers of hogs grow up on the mast of the forests, which cover a very large area. In 1900 the principal farm products were corn, 56,997,-

*For Map, see KENTUCKY.

880 bushels, valued at $27,928,961; wheat, 11,696,008 bushels, valued at $9,239,910; oats, 5,810,166 bushels, valued at $2,033,558; barley, 25,622 bushels, valued at $15,866; rye, 124,267 bushels, valued at $84,502; potatoes, 1,365,660 bushels, valued at $792,083; and hay, 313,432 tons valued at $3,698,498. The cotton crop for 1899–1900 was 192,263 bales.

Manufactures.—According to the United States census of 1900, the State had 8,007 manufacturing establishments, employing $71,182,966 capital and 53,820 persons; paying $19,777,449 for wages and $63,384,665 for materials; and having products aggregating in value $107,437,879. The most important industries, according to the value of output were the manufacture of flour and grist ($21,798,929); lumber and timber ($18,127,784); iron and steel ($5,080,624); foundry and machine shop products ($4,074,509; railroad cars ($3,113,053); cotton seed oil and cake ($2,980,041); leather ($2,802,117); and planing mill products ($2,273,457).

Banking.— On Oct. 31, 1901, there were reported 56 National banks in operation, having $7,300,000 in capital, $3,717,930 in out-standing circulation, and $3,637,500 in United States bonds. There were also 132 State banks, with $5,656,337 capital, and $1,009,350 surplus; and 7 stock savings banks, with $392,500 capital, and $3,519,333 in savings deposits. The exchanges at the United States clearing houses at Memphis, Nashville, Knoxville, and Chattanooga, for the year ending Sept. 30, 1901, aggregated $292,825,565; an increase over those of the preceding year of $40,435,391.

Commerce.—The imports of merchandise at the ports of Memphis, Nashville, Knoxville, and Chattanooga, during the year 1900 aggregated in value $126,609. The collections for internal revenue in the State during the fiscal year ending June 30, 1900, amounted to $2,295,606.

Education.—At the end of the school year 1899–1900, the children of school census age numbered 691,570; the enrollment in public schools, 485,354; and the average daily attendance 338,566. There were 7,185 public school buildings, public school property valued at $3,063,568; and 9,195 teachers. The receipts for the year amounted to $1,809,246; and the expenditures, $1,751,047. For higher education there were 101 public high schools, 101 private secondary schools, 1 public, and 13 private normal schools, 27 universities and colleges for men and for both sexes, and 12 women's colleges. The principal colleges are the University of Nashville, and Vanderbilt University, at Nashville, University of the South at Sewance; U. S. Grant University, at Athens, and the University of Tennessee, at Knoxville. The women's colleges include the Tennessee Female College, at Franklin; Ward Seminary, at Nashville; and Rogersville Synodical College at Rogersville.

Churches.—The strongest denominations in the State are the Methodist Episcopal, South; African Methodist; Regular Baptist, colored; Cumberland Presbyterian; Methodist Episcopal; Disciples of Christ; Roman Catholic; Presbyterian, South; Primitive Baptist; Protestant Episcopal; and Presbyterian, North. In 1899 there were reported 4,475 Evangelical Sunday-schools, with 35,919 officers and teachers, and 239,406 scholars.

Postoffices and Periodicals.— On Jan. 1, 1901, there were 2,959 postoffices of all grades and 288 periodicals, of which 14 were daily, 7 semi-weekly, 220 weekly, 2 bi-weekly, 5 semi-monthly, 36 monthly, 1 bi-monthly, and 3 quarterly.

Railroads.—The total length of railroads within the State on Jan. 1, 1901, was 3,188 miles, of which 86 miles were constructed during the previous year.

Finances.— On June 1, 1901, the total interest bearing debt of Tennessee was $15,946,000; and the estimated amount of bond not yet funded, $678,666. The assessed property valuation of the State in 1900 was as follows: acres, $171,527,025; town lots, $120,338,355; other property, $48,493,768; total valuation, $340,359,148. There was also railroad, telegraph and telephone property valued at $56,630,201. State tax rate $3.50 per $1,000.

State Government.—The Governor is elected for a term of two years and receives a salary of $4,000 per annum. Legislative sessions are held biennially and are limited in length to 75 days each. The Legislature has 33 members in the Senate and 99 in the House, each of whom receives $4.00 per day and mileage. There are 10 Representatives in Congress. The State government in 1902 was Democratic.

History.— In 1756 a settlement was formed near Knoxville, then a part of North Carolina; Nashville was settled near the close of the Revolution; in 1790 Tennessee was organized as a territory with Kentucky; and admitted in 1796 to the Union as a separate State. In January, 1861, a proposition to secede from the Union was defeated; but in June, carried by a majority of 57,567. In 10 months the State raised 50 regiments for the Southern Confederacy; while 5 or 6 were also recruited for the Union. The State was the scene, at Knoxville and Chattanooga, of some of the most important operations of the war. For years after the general pacification of the country, local disorders continued in Tennessee to disturb the tranquillity of the community, and it was only in 1870 that, after the adoption of the 15th amendment to the Constitution of the United States, and of a new State constitution, Tennessee was readmitted to representation in Congress.

Tennessee, a river of the United States, formed by the union of two streams in the E. part of the State of Tennessee, flows S. W., passes through the N. part of Alabama, then flows N. through the W. part of Tennessee and Kentucky, and enters the Ohio, of which it is the largest tributary, about 10 miles below the confluence of the Cumberland. Length, about 1,200 miles. It is navigable 259 miles for steamers to Florence, at the foot of the Mussel-shoal Rapids, which are passed by a canal 36 miles long; and above these there is navigation for boats for 250 miles.

Tennessee, Society of the Army of the, the second society composed of soldiers organized during the Civil War. The preliminary meeting for the formation of the society was held in the Senate Chamber at the State capitol, Raleigh, N. C., April 14, 1865. Membership in the society was restricted to officers who had served with the Old Army of the Tennessee. The society erected in Washington, at a cost of $50,000, a handsome equestrian statue of Maj.-Gen. John A. Rawlins, and has also placed an appropriate memorial, costing $23,000, over the grave of Maj.-Gen. James B. McPherson, at Clyde, O., an equestrian statue of General McPherson in Washington, and a monument in memory of Gen. John A. Logan in Washington.

Tennessee, University of, a coeducational non-sectarian institution in Knoxville, Tenn.; opened in 1794; has endowment exceeding $425,000; grounds and buildings valued at over $575,000; scientific apparatus, etc., $170,000; volumes in the library, about 28,000; ordinary income, $175,000; average number of faculty, 135; average students, 970.

Tenney, Edward Payson, an American author; born in Concord, N. H., Sept. 29, 1835; studied at Dartmouth College in 1854–1855, and was graduated at Bangor Seminary in 1858. He was for many years the pastor of the Congregational Church in Easton, Mass.; for a short time editor of the "Pacific" in San Francisco, and the "Congregational Review" in Boston; and president of Colorado College in 1876–1884. His publications include "The Silent House"; "Agamenticus"; "Colorado and the New West"; "Constance of Acadia"; "A Story of the Heavenly Camp Fires"; "Our Elder Brothers"; "The Dream of My Youth"; etc.

Tenney, Mrs. Sarah (Brownson), an American novelist; born in Chelsea, Mass., June 7, 1839. She was a daughter of Orestes A. Brownson. Her books are: "Marion Elwood" (1859); "At Anchor" (1865); and "Life of Demetrius Gallitzin, Prince and Priest" (1873). She died in Elizabeth, N. J., Oct. 30, 1876.

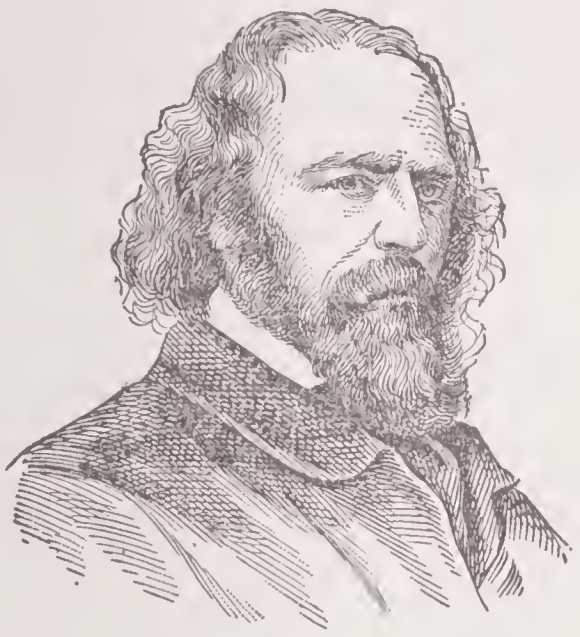
Tenniel, John, an English artist; born in London in 1820. He was almost entirely self-taught, and his first picture was exhibited while he was little more than a boy. He painted one of the frescoes in the Houses of Parliament in 1845, and produced but few pictures afterward. In 1851 he became connected as an illustrator with "Punch," and contributed illustrations to that paper, in particular the weekly political cartoon. He also illustrated many Christmas and other books, including "Æsop's Fables," "Ingoldsby Legends," "Alice's Adventures in Wonderland," etc. He was knighted in 1893.

Tennis, a game played with small hard balls in a specially constructed court by two opponents who keep the ball continually in motion by striking it with a racket. Games of ball have a very remote origin. The Greeks indulged in them, and considered Aristotle worthy of a statue for his skillful play. Throughout the dark ages the ancient game seems to have undergone various modifications in different European countries. Tennis is supposed, from the terms still used in the game, to have originated in France prior to the 15th century. It became very fashionable in England during Charles II.'s reign, but is now superseded by rackets, for which there are courts at the universities and public schools. A racket court measures 120 feet long and 45 broad, and is divided by a net across the center into the dedans and hazard sides, in each of which a player is stationed. Each side is subdivided into first gallery, door, second gallery, and last gallery; on the dedans side, the last gallery has six compartments called chaces, and two like compartments occur in the second gallery of the hazard side. The play begins from the dedans side, hence it is also known as the service side, and the game is played in sets of six games of four strokes each. A marker is required to note the progress of the play.

Tennis, Lawn, an out-door game played with balls, which are of hollow rubber, covered with smooth white cloth, cemented to the ball, on a piece of smooth, level sward. It remotely resembles tennis. The players are separated from each other by a low net, stretching across the ground, over which they strike a tennis ball with rackets resembling tennis bats. The net should be 42 inches high at the sides of the court and 36 inches high in the middle. Each ball is two and a half inches in diameter and weighs two ounces. The weight of the racket may vary from 10 to 20 ounces. The modern game of lawn tennis was originated by Major Wingfield in Wales in 1874, and introduced into the United States the same year by F. R. Sears and James Dwight.

Tennyson

Tennyson, Alfred, Lord, an English poet; born in Somersby, England, Aug. 6, 1809. He received his early education from his father, attended Louth Grammar School, and in due course proceeded to Trinity College, Cambridge, where in 1829 he won the chancellor's medal by a poem in blank verse entitled "Timbuctoo." As early as 1827 he had published in conjunction with his brother Charles, "Poems by Two Brothers," but his literary careeer may be said to date from 1830, when he published a volume entitled "Poems, chiefly Lyrical." It was not received with any great favor by the public, though it was recognized by many to contain much that distinguishes the true poet. Its success at least was sufficient to encourage the poet to prepare a second collection, which appeared in 1833, and contained such poems as "A Dream of Fair Women," "The Palace of Art," "Œnone," "The Lady of Shalott," and others. At this time he sustained a great loss in the death of his friend Arthur Hallam, and this, with the severe criticism which his last volume received in "Blackwood's Magazine" and the "Quarterly Review," may have occasioned his long silence. It was not till 1842 that he again appealed to the public with a selection of his poems in two volumes, and it is from this time that we find his work beginning to receive wide recognition. The collection then issued included "Morte d'Arthur," "Locksley Hall," "The May Queen," and "The Two Voices," all of which, it was almost at once acknowledged, entitled him to rank high among our poets. His reputation was more than sustained by the works that immediately followed. These were: "The Princess, a Medley" (1847); "In Memoriam" (1850), written in memory of his friend Arthur Hallam; and the "Ode on the Death of the Duke of Wellington" (1852). The latter was his first great poem after receiving the laureateship (1850) upon the death of Wordsworth. Thereafter hardly a year passed without his adding some gem to our language. "Maud and other Poems" was published in 1855; "Idylls of the King" followed in 1858; "Enoch Arden and other Poems," in 1864; "The Holy Grail and other Poems," in 1869; "The Window, or the Songs of the Wrens," in 1870; and "Gareth and Lynette," in 1872, the latter volume, which included the "Last Tournament," completing the series of poems known as the "Idylls of the King." In 1855 the University of Oxford conferred on Tennyson the honorary degree of D. C. L., and in 1869 the fellows of Trinity College, Cambridge, elected him an honorary fellow. So long ago as 1833 he had had printed for private circulation a poem entitled "The Lover's Tale"; in 1879 this was republished, together with a sequel entitled "The Golden Supper." In the following year appeared "Ballads and other Poems." Among his later compositions are the dramas, "Queen Mary" (1875); "Harold" (1876); and "The Cup." The latter was successfully produced by Mr. Irving at the Lyceum Theater in 1881, as had also been "Queen Mary." "The Falcon," another drama, was produced by Mr. and Mrs. Kendal in 1882, and "The Promise of May" was brought out at the Globe Theater the same year. "The Cup" and "The Falcon" were published as a single volume in 1884, and in the same year appeared the historical drama of "Becket." In 1885 appeared "Tiresias and other Poems"; in 1886 "Locksley Hall: Sixty Years After," which also included "The Promise of May"; in 1889 "Demeter and other Poems" and in 1892 his last book, "The Death of Œnone: Akbar's Dream and other Poems." Tennyson was raised to the peerage in 1884 as Baron Tennyson of Aldworth, Sussex, and Freshwater, Isle of Wight. He died in Aldworth, England, Oct. 6, 1892, and was buried in Westminster Abbey.



ALFRED TENNYSON.

Tennyson, Charles. See TURNER, CHARLES TENNYSON.

Tennyson, Frederick, an English poet, brother of Alfred; born in Louth, Lincolnshire, June 5, 1807. He was educated at Trinity College, Cambridge, and in 1828 took the medal for a Greek poem. He published various volumes of verse, including "Days and Hours" (1854); "The Isles of Greece" (1890); "Daphne, and Other Poems" (1891). He died in London Feb. 26, 1898.

Tennyson, Hallam, Lord, an English biographer, son of Alfred; born Aug. 11, 1852; was educated at Marlborough College, and Trinity College, Cambridge. He wrote "The Life of Alfred, Lord Tennyson" (2 vols. 1897), contained a complete biblio-

graphy of his father's works; various magazine articles; and edited Charles Turner's "Collected Sonnets."

Tenon, or **Tennon,** in carpentry, the projecting end of a piece of timber fitted for insertion into a mortise, formed by cutting away a portion on one or more sides; sometimes made cylindrical. The usual joint in putting up wooden frames, whether of buildings or machines. Tenons are secured in their mortises by pins, or by giving them a dovetail, which is driven into the undercut mortise by means of a wedge or backing block.

Tenor, in law, a transcript or copy. It implies that a correct copy is set out, and therefore the instrument must be set out correctly, even though the pleader may not have set out more than the substance or purport of the instrument.

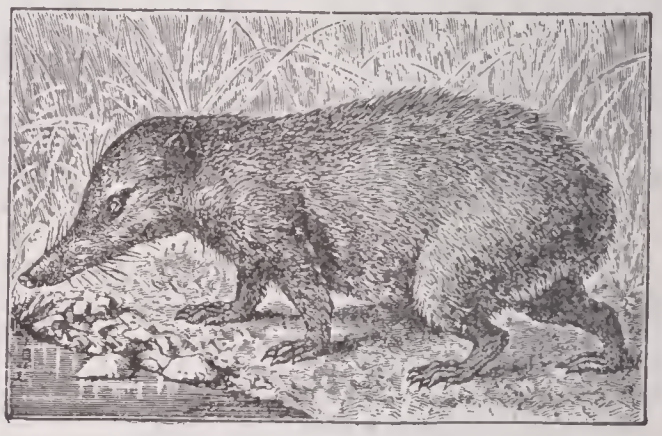
In music: (1) The third of the four kinds of voices arranged with regard to their compass. It is the highest of the male chest voices, and its extent lies between tenor C and treble A. The tenor voice is sometimes called by way of distinction "the human voice," from an idea that it is the quality and compass of voice most common to man. The Plain Song of the Church was formerly given as a tenor part, the harmonies being constructed above and below it. The name is derived from the holding or sustaining note which was given formerly to this voice. In old music the tenor voice was divided into three classes, which were called high, mean, and low tenor. (2) The third of the four parts in which concerted or harmonized music for mixed voices is usually composed; the part above the bass. Formerly the music for this part was written on a staff marked with the tenor clef; but now it is generally written in displayed or full-score music on the staff marked with the treble clef, and is sung an octave lower. In compressed and short-score music it is written on the bass staff and its supplementary upper ledger lines. (3) One who possesses a tenor voice; one who sings a tenor part. (4) An instrument which plays a tenor part. (5) The larger violin of low pitch is called the tenor, alto viola, bratsche, and sometimes alto violin. (6) A tenor bell.

Tenorite (after the Neapolitan savant, Tenore), a variety of melaconite, occurring in very thin crystalline scales of a shining black color on volcanic scoria at Vesuvius. Lately shown, on optical grounds, to be triclinic in crystallization.

Tenotomy, the subcutaneous division of tendons; a surgical operation now very extensively practised in the cure of club-foot and other deformities. The operation was first practised by Stromeyer, who divided the tendon Achilles in 1831 by subcutaneous puncture. The operation consists in passing a small thin knife through a minute puncture close to the contracted tendon, dividing it, if possible, without injuring any part in its vicinity. The puncture is carefully closed, and the wound generally heals by the first intention. Tenotomy is generally employed in the case of club-foot; sometimes to facilitate the reduction of a fractured bone or a dislocation; also for squint and wry-neck, and various deformities.

Tenque. See GERARD THOM.

Tenrec, in biology, a genus of Insectivora, represented by one species (*C. ecaudatus*), which is restricted to Madagascar, Bourbon, and Mauritius. It is the largest known insectivore, measuring from 12 to 16 inches in length; and it is probably



THE TENREC.

the most prolific of mammals, since as many as 21 young are said to have been brought forth at a birth. The body is squat; there is hardly any tail; the adult males have long canines; the young have strong white spines in lines along the back, but these are afterward lost. It feeds chiefly on earthworms, and is said to become dormant during the hottest part of the year.

Tensor, the name of some muscles whose action is to stretch or make rigid some part. One of the most important is the tensor vaginæ femoris, or the musele that stretches the thigh and adjacent parts.

Tent, a portable pavilion or lodge, consisting of some flexible material, such as skins, matting, canvas, or other strong textile fabric, stretched over and supported on poles. Among uncivilized and wandering tribes tents have been the ordinary dwelling places from the earliest times, but among civilized nations they are principally used as temporary lodgings for soldiers when engaged in the field, for travelers on an expedition, or for providing accommodation, refreshment, etc., for large bodies of people collected together out of doors on some special occasion, as at horse races, fairs, cricket matches, or the like. Military tents are made of canvas, supported by one or more poles, and distended by means of ropes fast-

ened to pegs driven into the ground. Tents of a large size, such as are used for out-of-door fêtes, are known as marquees.

Also an apparatus used in field photography; a substitute for the usual dark room. It consists of a box provided with a yellow glass window in front, and furnished with drapery at the back, so as to cover the operator and prevent access of light to the interior. It is usually provided with shelves and racks inside, developing tray, and a vessel of water overhead, having an elastic tube passing to the inside, to convey water for washing the plate.

In Scotland, a kind of pulpit of wood erected out-of-doors, in which clergymen used to preach when the people were too numerous to be accommodated within-doors.

Tentacle, in zoölogy, an elongated appendage proceeding from the head or cephalic extremity of many of the lower animals, and used as an instrument of exploration and prehension. Thus the arms of the sea anemone, the prehensile processes of the cirripeds and annelids, the cephalic feet of the cephalopods, the barbs of fishes, are termed tentacles.

Tentaculifera, in zoölogy, an order of *Infusoria*, or a class of Protozoa. Animalcules bearing neither flagellate appendages nor cilia in their adult state, but seizing their food and effecting locomotion, when unattached, through the medium of tentacle-like processes developed from the cuticular surface or internal parenchyma; these tentacles are simply adhesive or tubular, and provided at their distal extremity with a cup-like sucking disk, an endoplast, and one or more contractile vesicles usually conspicuously developed; trichocysts rarely, if ever, present; increasing by longitudinal or transverse fission, or by external and internal bud-formation. They inhabit salt and fresh water; and are divided into two groups; Suctoria, in which the tentacles are wholly or partially suctorial, and Actinaria, in which they are merely adhesive.

Tenterden, Charles Abbot, Baron, an English jurist; born a barber's son in Canterbury, Oct. 7, 1762. A foundationer at King's School, Canterbury, of which he was captain at 17, he gained an exhibition which enabled him to proceed to Corpus Christi College, Oxford. Here he obtained a scholarship; in 1784 the chancellor's medal for Latin verse, in 1786 for an English essay; graduated in 1785, and soon after became fellow and tutor of his college. Entered at the Middle Temple, he was called to the bar by the Inner Temple in 1796. He joined the Oxford circuit, and, in spite of a husky voice, a heavy face, and timid manners, his energy and knowledge soon brought a large practice. In 1801 he became recorder of Oxford, and next year published his clear and learned treatise on the "Law Relative to Merchant Ships and Seamen." It had the effect of increasing his employment in the more lucrative mercantile causes, so much that in 1807 he returned his income as upward of $40,000. In 1816 he accepted a puisne judgeship in the Court of Common Pleas; and in 1818 he was knighted, and chosen to succeed Lord Ellenborough as Chief-Justice of the King's Bench. As a judge his most marked characteristic was his perspicacity and freedom from bias. He was raised to the peerage in 1827. In the House of Lords he strongly opposed the Catholic Relief Bill, and in his last speech he made a vow that if the Reform Bill, that "appalling bill," passed, he would never again take his seat as a peer. He fell ill at Bristol, while presiding at the trial of the mayor for misconduct during the Reform riots, and died suddenly, Nov. 4, 1832.

Tenthredinetæ, a family comprising hymenopterous insects in which the female has an ovipositor consisting of double saws lodged under the body, and covered by two pieces which serve as a sheath. They are sluggish in their habits, and fly only in the warmest days. Their larvæ have from 18 to 22 legs, and are found in communities on the leaves of birch and alder, holding on by their true legs, while the rest of the body is curved curiously upward; or appearing like slugs on the leaves of the pear and other fruit trees, and those of the rose; while others feed on the stems of plants, or roll up a leaf, or construct cases of particles of leaves to hide in.

Tenthredo, the sawfly, the typical genus of *Tenthredinidæ*. Upper wings with four submarginal cells; antennæ with the third and fourth joints of the same length. *T. æthiops*, a small black species, deposits eggs on cherry and other fruit trees. The larvæ are black, and often numerous enough to do the trees great damage. *T. grossulariæ* is the gooseberry sawfly.

Tenuirostres, one of the four sections into which the order *Insessores* of birds is divided. This group, represented by the humming birds, creepers, sunbirds, hoopoes, etc., is characterized by the generally elongated bill, which usually tapers to a point.

Tenure, the act, manner, or right of holding property, especially real estate. Land may be held according to two main principles, feudal or allodial (see these words). The former is the principle universal in England. In the United States the title to land is essentially allodial, and every tenant in fee-simple has an absolute and perfect title. Yet in technical language his estate is called an estate in fee-simple, and the tenure free and common socage. Also the consideration, condition, or service, which the occupier of land gives to his landlord for the use of his land; and the manner

of holding in general; the terms or conditions on which anything is held or retained.

Tenure=of=office Act, in the United States, a bill passed by Congress in February, 1867, limiting the powers of the President in removals from office. Among other things, it took from the President the power to remove members of his cabinet excepting by permission of the Senate, declaring that they should hold office "for and during the term of the President by whom they may have been appointed, and for one month thereafter, subject to removal by and with the consent of the Senate." President Johnson vetoed this bill (March 2) when it was passed over his veto and became a law.

Tenures of Land. Nearly all the real property of England is supposed to have been granted by a superior lord, and to be held from him in consideration of certain services to be rendered to him by the tenant. By an act of Parliament, military tenures were changed into socage.

Teocalli, or **Teopan,** the names of the temples of the native Mexicans. They were generally solid, quadrilateral, truncated pyramids, built of earth cased with brick. On the upper surface were several large towers, forming the temple proper, and containing the images of the gods. The pyramid was surrounded by several slightly spiral terraces. A staircase ascended at one of the angles to the first terrace, which went round the building with a slight ascent till it came directly above the top of the stair; from this point another stair led up to the second terrace, and so on. Thus it was necessary to go round the building several times before reaching the platform at the top. On this platform a fire burned always, and was visible at a great distance. Human and other sacrifices were offered here. The teocalli were very numerous; every large town had several hundred. The best preserved are those at Cholula and Palenque.

Tephrine, or **Tephrite,** a name originally given to a gray, ashlike rock of loose texture, the base of which was trachytic. Subsequent investigation has shown, however, that it consists of a plagioclase felspar, associated with either nepheline or leucite, and sometimes with both, and also several accessory minerals. This name has been until recently used by French geologists; but Rosenbusch has adopted it as a designation of a "family" of rocks, most of which are equivalent to the phonolites.

Tephrodornis, in ornithology, a genus of *Prionopidæ* (in some classifications, of *Laniidæ*, when they are placed in the subfamily *Dicrurinæ*), with four species, from the Oriental region. The frontal feathers are bristly and incurved. They go about in small flocks, carefully hunting for the insects on which they feed.

Tephrosia, in botany, a genus of *Galegeæ*. Tropical or sub-tropical trees, shrubs, or herbs, usually with unequally pinnated leaves, covered with a gray silky down, and lanceolate or subulate stipules. Flowers mostly in axillary racemes, white or purplish; calyx campanulate, with five nearly equal teeth; stamens in one or two bundles; legume linear, compressed, straight, or curved, many-seeded. The young branches of *T. toxicaria* and *T. cinerea*, West Indian plants, with the leaves pounded and sometimes mixed with quicklime, are thrown into pools and mountain streams to poison fish. The smaller fry die; the larger fishes, though temporarily stupefied, generally recover. An infusion of the seeds of *T. purpurea*, a copiously branched perennial, one or two feet high, common in India, is given as a cooling medicine. A decoction of the bitter root is given in dyspepsia, lientery, tympanitis, etc. *T. senna* is used as a purgative by the inhabitants of Popayan. A blue dye is extracted from *T. tinctoria*, an undershrub growing in Mysore, etc. *T. apollinea* in Nubia and *T. toxicaria* in the Niger region are also dye plants. *Tephrosia* is also a genus of geometer moths, family *Boarmidæ*.

Tepidarium, in Roman antiquities, an apartment in Roman baths where the tepid water was placed; also the boiler in which the water was warmed for the tepid bath.

Teplitz, a watering place in Bohemia; situated in a beautiful valley near the Erzgebirge; 20 miles N. W. of Leitmeritz. The baths are supplied from about a dozen hot alkalo-saline springs, are taken exceedingly hot, and have great virtue in restoring persons afflicted with gout, rheumatism, etc. One of the springs is used also for drinking. Pop. of Teplitz, with Schönau, 16,750.

Terai, or **Turrye,** the name of the narrow strip of swampy jungle which uniformly underlies the lowest ridge of the Himalaya Mountains in the N. of India, continuously from Kumaon to Assam. This is about 15 miles wide, and is kept perpetually moist by rivulets, and by infiltration from a peculiar bed of bowlders and sand, called *bahbur*, which immediately adjoins it above. It is overgrown with jungle and enormous grasses, the home of tigers and other wild beasts. At no time can it be healthy, and at certain seasons of the year the malaria is absolutely fatal to strangers, though the aboriginal tribe of Therus seems to flourish. Proceeding from the W., the first portion lies in the Rohilcund division of the Northwest Provinces, forming the district of Terai, with an area of 920 square miles; the chief town Kashipur. The next portion, bordering Oudh and Behar, lies chiefly within Nepal territory. The third piece was annexed from Bhutan after the war of 1864, and is known as the East and West Duars.

Teraphim, in Jewish antiquities, household gods, like the Roman penates. The "images" which Rachel stole from her father Laban are called in Hebrew teraphim (Gen. xxxi: 19, 34, 35). Perhaps they were the "strange gods" given up by Jacob's household, and by him hid under the "oak" at Shechem (xxxv: 2, 4). Again, the "image" which Michal put in David's bed, and which was intended to be mistaken for him, is called in Hebrew teraphim, a plural form, though apparently only with a singular meaning. It was probably of the human form and size (I Sam. xix: 13). Micah manufactured one or more (Judges xvii: 5, xviii: 14, 17, 18, 20). Teraphim are often mentioned in connection with ephods, and in Zech. x: 2, it is stated that the teraphim (Authorized Version, idols) have spoken vanity, implying that they were consulted as oracles by the Jews, as ephods were (I Sam. xxiii: 9, 12, xxx: 7). The Babylonians used them for a similar purpose (Ezek. xxi: 21). Samuel denounced them (I Sam. xv: 23)., and Josiah put them away, with wizards, idols, etc. (II Kings xxiii: 24). The English reader must have recourse to the Revised Version to find where the word teraphim occurs in the Old Testament, as in all but one passage (Hosea iii: 4) the Authorized Version translates it by other words.

Teratology, the study of malformations or abnormal growths, animal or vegetable. Those of the animal kingdom are treated under Monstrosity, Deformities, Club-foot, Dwarf, Harelip (*q. v.*). Those of the vegetable world form part of the subject of vegetable pathology, which deals with the diseases of plants (see Plants), and with excrescences caused by animals and parasites. Under this head come also abnormal forms like four-leaved clover, etc., as well as changes in the form of plants brought about by the skill of gardeners and agriculturists — such as the bulbous modification of the roots of turnips, the development of such a growth as cauliflower, the production of double-flowering plants, and the metamorphosis of organs.

Terbium, in chemistry, a metal, supposed by Mosander in 1843 to exist, together with erbium and yttrium, in gadolinite. Subsequent investigations have thrown considerable doubt on its existence, and it is now believed to be yttria contaminated with the oxides of the cerium metals.

Terburg, or **Terborch, Gerard,** a Dutch genre painter; born in Zwolle, Holland, about 1617. His father, a historical painter, gave him his first lessons in painting. He continued his studies at Haarlem, and afterward visited Germany, Italy, Spain, England, and France. On the meeting of the Peace Congress at Münster in 1646 he painted the assembled plenipotentiaries, which is now in the National Gallery, London. He subsequently visited Madrid, London, and Paris, whence he returned to Overyssel, married, and became burgomaster of Deventer. His portraits and pictures of social life are remarkable for elegance. He excelled in painting textile fabrics, particularly satin and velvet. He died in Deventer Dec. 8, 1681.

Terce, one of the two legal life rents in the law of Scotland, being a real right constituted without covenant, or sasine. By it a widow, who has not accepted any special provision, is entitled to the life rent of one-third of her husband's heritable (real) estate, provided the marriage has lasted for a year and a day, or has produced a living child. If special provision is granted by a husband to his wife by any antenuptial or postnuptial contract or other deed, the wife shall be thereby excluded from her terce, unless the contrary be provided in the same deed. The life rent bears its proportion of burdens affecting the estate. The mansion house, if there be only one, feu duties, rights of reversion, superiority, and patronage, are not subject to the right of terce. See Dower.

Terceira, an island of the Atlantic, one of the Azores; greatest length, 20 miles; average breadth, 13 miles; area, 223 square miles. The soil possesses great natural fertility, and heavy crops of grain, pulse, etc., and abundance of oranges, lemons, and other fruits are produced; capital, Angra. Pop. 46,528.

Tercine, in botany, Mirbel's name for what he considered a third coating of some seeds, internal to the secundine and primine. It is really only a layer of the primine or secundine, or the secundine itself. Called by Malpighi the chorion.

Tercy, François, a French poet; born in Lons-le-Saulnier, Jura, about 1774. He wrote: "Epithalamium of Napoleon and Marie Louise" (1810); "Birth of the King of Rome" (1811); "Death of Louis XVI.," an idyl in the ancient style (1816); "Death and Apotheosis of Marie Antoinette" (1817); "Death of Louis XVIII." (1818). He died in Le Mans Oct. 1, 1841.

Terebamic Acid, in chemistry, formula, $C_7H_{11}NO_3 = (C_7H_8O_2)''\left\{\begin{matrix}H_2\\H\end{matrix}\right\}\left\{\begin{matrix}N\\O\end{matrix}\right.$; terebamide; prepared by heating terebic acid in ammonia gas to 140–160°. It is slightly soluble in cold, very soluble in hot water and in alcohol.

Terebella, in surgery, a trepan or trephine. In zöology, the typical genus of *Terebellidæ*. The sheath consists of sand, pieces of shell, and other adventitious par-

ticles, held together by a glutinous secretion, from the body. The young when first they quit the eggs, are small, globular embryos, thickly covered with cilia. Then the body becomes elongate and the cilia collect in a band round the middle; eyes appear. Next the cilia diminish in size and disappear, the animal becomes able to creep along the bottom of the water; finally it builds its tube and moves about no more.

Terebellidæ, in zoölogy, a large family of *Tubicolæ*. Animals sometimes eight or nine inches long, worm-shaped, thick in front and narrow behind, cephalic region often with a collar; tentacles numerous, filiform, in two groups around the mouth; no proboscis; branched or pectinate branchiæ on some of the anterior segments.

Terebene, $C_{10}H_{16}$; an optically inactive isomer of oil of turpentine, prepared by the action of strong sulphuric acid on terebenthene. It has the odor of thyme oil; sp. gr., 0.864, and boils at 156°.

Terebenthene, $C_{10}H_{16}$; Berthelot's name for the chief constituent found in French oil of turpentine, and readily obtained by neutralizing the oil with an alkaline carbonate, and distilling first over the water-bath, and then in a vacuum. It has a sp. gr.= 0.864, boils at 161°, and has a specific rotatory power of — 42.3.

Terebentilic Acid, in chemistry, formula, $C_8H_{10}O_2 = C_6H_6 \left\{ \begin{matrix} CO \cdot OH \\ CH_3 \end{matrix} \right.$; a monobasic acid obtained by passing the vapor of turpentine over soda-lime, heated to 400°, and treating the resulting mass with hydrochloric acid. It is heavier than water, melts at 90°, boils at 250°, is slightly soluble in boiling water, but very soluble in alcohol and ether. Its vapor is acrid.

Terebenzic Acid, $C_{14}H_7O_4(?)$; produced by the action of nitric acid on oil of turpentine. It crystallizes in small shining needles, insoluble in cold, soluble in boiling water and in cold alcohol, melts at 169°, and boils at a much higher temperature.

Terebic Acid, in chemistry, formula, $C_7H_{10}O_4 = \left. \begin{matrix} (C_7H_8O_2)'' \\ H_2 \end{matrix} \right\} O_2$; terebenic or terebilic acid; a dibasic acid prepared by heating oil of turpentine with four parts of nitric acid of sp. gr. 1.25. It crystallizes in four-sided, colorless prisms, with oblique terminal faces, dissolves in about 100 parts of cold water, more readily in boiling water, alcohol, and ether; melts at 200° without loss of weight, but at a higher temperature begins to decompose. It forms salts called terebates, of little importance.

Terebic Ethers, acid ethers prepared by the direct action of terebic acid on the several alcohols: thus, ethylterebic acid, $C_7H_9(C_2H_5)O_4 = \left. \begin{matrix} C_7H_8O_2 \\ C_2H_5 \\ H \end{matrix} \right\} O_2$, is an oil having a burning taste, sparingly soluble in water, and very unstable.

Terebintaceæ, or **Terebinthaceæ,** in botany, an order founded by Jussieu in 1789, and including all the turpentine-bearing plants. These are now distributed among the orders *Amyridaceæ, Anacardiaceæ, Connaraceæ, Xanthoxylaceæ,* etc.

Terebinth Tree, in botany, the *Pistacia terebinthus*, the Chio or Cyprus turpentine tree. Leaves unequally pinnate, generally three pairs with a terminal one; flowers small; fruit small, dark, purple, rounded, and furrowed. The turpentine flows from incisions in the stem, and is left to harden. A gall produced on the tree by the puncture of insects is used in dyeing, and for tanning one kind of morocco leather.

Terebra, in zoölogy, the auger shell; a genus of *Buccinidæ*. Shell long, pointed, many whorled; aperture small; canal short; operculum pointed, nucleus apical. Animal blind, or with eyes near the summit of minute tentacles. All the shells are smooth, and ornamented with variegated spots, generally red, brown, and orange. Recent species 110, mostly tropical. Fossil 24, from the Eocene of Great Britain, France, and Chile.

Terebralia, in zoölogy, a sub-genus of *Potamides*. Shell pyramidal, columella with a prominent fold toward its apex, and a second less distinct one on the basal fronts of the whorls. From India and North Australia. *T. telescopium* is so abundant near Calcutta that the shells are burnt for lime.

Terebrantia, a section of hymenopterous insects, characterized by the possession of an anal instrument organized for the perforation of the bodies of animals, or the substance of plants. The borer (*terebra*) is peculiar to the female, and is composed of three long and slender pieces, of which two serve as a sheath for the third.

Terebratella, in zoölogy, a genus of *Terebratulidæ*, with 25 species distributed among several sub-genera. Shell smooth or radiately plaited; dorsal valve longitudinally impressed; hinge-line approximately straight; beak with a flattened area on each side of the deltidium, which is incomplete, foramen large; loop attached to the septum. The genus appears first in the chalk formation.

Terebratula, in zoölogy and palæontology, the type genus of *Terebratulidæ*. Shell smooth, convex; beak truncated and perforated; foramen circular; deltidium of two pieces frequently blended; loop very short, simple, attached by its crura to the hinge-plate. Animal attached by a pedicle; bra-

chial disk trilobed, center lobe elongated and spirally convoluted. *Terebratula* proper has three recent species, from the Mediterranean, Vigo Bay, and the Falkland Islands; fossil, 120, from the Devonian onward. Subgenera: *Terebratulina*, *Waldheimia*, *Meganteris*, and *Rensselæria*, the latter from the Silurian to the Devonian.

Terebratulidæ, in zoölogy, a family of *Brachiopoda*. Woodward enumerates five genera, to which Tate adds two others. Shell minutely punctate; usually round or oval, smooth or striated; ventral valve with a prominent beak and two curved hinge-teeth; dorsal valve with depressed umbo, a prominent cardinal process between the dental sockets, and a slender shelly loop. Animal attached by a pedicle, or by the ventral valves; oral arms united by a membrane, variously folded, sometimes spiral at their extremities. The family is numerous and widely distributed in time and space. The generic and sub-generic forms are usually classified according to the modifications of the loop or calcified support for the respiratory and alimentary organs, the simplest and highest type of this loop being found in *Terebratula*. The family was represented in Silurian seas, and reached its maximum about the dawn of the Tertiary epoch, since when many of its representatives have become extinct.

Terebratulina, in zoölogy, a sub-genus of *Terebratula*. Loop short, rendered annular in the adult by the union of the oral processes. Recent species six, from the United States, Norway, Cape, and Japan; fossil 22, from the Oxford Clay.

Terecamphene, in chemistry, a solid crystallizable body, somewhat resembling camphor, produced by heating to 220° the solid hydro-chloride prepared from French turpentine, with potassium stearate or dry soap. It melts at 45°, and boils at 160°.

Terechrysic Acid, $C_6H_8O_5$; an acid, said to be obtained, together with oxalic, terephthalic, and terebic acids, in the watery liquid obtained by oxidizing oil of turpentine with nitric acid diluted with an equal bulk of water.

Teredina, in zoölogy, a sub-genus of *Teredo*. The valves have an accessory valve in front of the umbones, the aperture of the tube is sometimes shaped like an hour glass, or six-lobed.

Teredo, in botany, any disease in plants produced by the boring of insects.

In zoölogy and palæontology, a genus of *Pholadidæ*, worm-like mollusks, having a sucker-like foot with a foliaceous border, and long, cord-like gills; shell globular, open in front and behind, lodged at the inner extremity of a burrow, in whole or in part lined with shell; valves three-lobed, concentrically striated. Known species; recent, 21, from Great Britain, Norway, the Black Sea, and the tropics, to 119 fathoms deep. *T. navalis*, the ship worm, is a soft, cylindrical, somewhat vermiform mollusk, two or two and a half feet long, with two small shells at its anterior extremity. It bores into timber, and is exceedingly destructive to ships. In 1731 and 1732 it created alarm in Holland by boring into the piles constituting part of the defense of the country against the inroads of the sea. Though teak is not so easily attacked as many other kinds of timber, yet it does not wholly escape. The best protection against the teredo is metal sheathing and broad-headed iron nails hammered into the wood. Fossil species 24, from the Lias onward. Used also of any individual of the genus.

Terek, a river in Russian Caucasia, rises near Mount Kasbec, flows in an E. direction, and enters the Caspian by many branches after a course of 350 miles. It has a descent, after reaching the plain (Mosdok), of 40 centimeters to the kilometer, and is utilized for irrigation in the district to which it gives name, and which is specially noted for its warm springs and petroleum wells The district lying between the province of Stavropol and the highlands of Daghestan, has an area of 34,637 square miles.

Terentius Afer, Publius (more commonly TERENCE), a Roman poet; born in Carthage, whence his surname Afer, 185

TERENCE.

B. C. Some authorities place him 10 years earlier. Following immediately after Cæcilius, the most popular representative of Roman comedy after Plautus, he was the last of the comic dramatists of Rome of whom we have anything remaining. The extant records of the life of Terence are more than apocryphal. His history, so far as it seems worthy of acceptance, may be briefly given. He was either taken prisoner in war or sold in the slave market. His

purchaser, or at all events the Roman into whose hands he fell, was a senator, Lucanus Terentius. On obtaining his freedom he took his patron's name. A liberal education followed, and we soon find him the friend and associate of the great and noble. He was gifted with dramatic genius. Whether his plays were his unaided productions, or were amended by his patrons Lælius and the younger Scipio, matters but little. The works that bear his name are as much his genuine compositions as are the plays of Colman, Cumberland, or Gay, whose dramas were admittedly combed and corrected by competent hands before representation. Terence was beyond question the chief dramatist of his time. He used, moreover, the Latin tongue with singular grace and elegance. Critics have denied to him the possession of lively humor. Ancients and moderns, however, are agreed that, though a freedman and a foreigner, he divides with Cæsar and Cicero the palm of pure Latinity. Terence was the interpreter of Menander; but he was more than a mere translator. His six comedies that remain belong to the "Fabula Palliata." It is said that Terence went to Greece and translated 108 of Menander's plays. Whether he was lost on his homeward voyage, as some say, or lost his transcripts and died of grief in consequence, we have no means of deciding. Probably his stock consisted of little more than notes. Translations could hardly have been produced during his brief sojourn. He died in his 26th year, 159 B. C. He owned an estate of 20 *jugera* contiguous to the Appian Way, and after his death his only daughter married a Roman knight. The following are his comedies, with the years of their production: (1) "Andria" (The Woman of Andros), 166 B. C.; (2) "Hecyra" (The Stepmother), 165 B. C.; (3) "Hautontimoroumenos" (The Self-Tormentor), 163 B. C.; (4) "Eunuchus" (The Eunuch), 162 B. C.; (5) "Phormio," 162 B. C.; (6) "Adelphi" (The Brothers), 160 B. C.

The *editio princeps* of Terence was published at Strassburg in 1470. Other noteworthy editions are those of Muretus (1555), Madame Dacier (1688), Bentley (1726), A. Fleckeisen (1857), Parry (1857), W. Wagner (1869). The works of Terence have been translated into almost every European tongue. The late Judge Frederick W. Ricard, of the New Jersey Historical Society, translated a number of Terence's comedies, and was preparing a new and much enlarged edition at the time of his death (1897). He had the largest collection of editions of Terence in the United States.

Terephthalic Chloride, $C_8H_4O_2Cl_2$; produced by the action of phosphoric pentachloride on terephthalic acid. It forms beautiful crystals, smells like benzoic chloride, and resembles it in all its reactions.

Teresa, or **Theresa, St.,** one of the most remarkable of the women saints of the modern Roman calendar; born in Avila, Old Castile, Spain, March 28, 1515, of the noble house of Cepeda. Even as a child she was remarkable for piety of a most enthusiastic kind; and, educated in a convent in her native city, she entered a convent of the Carmelite order there in 1534. In this convent she continued to reside for nearly 30 years, but it was not till about the year 1539 that her constitution became strong enough to permit her to follow, even in an imperfect way, the observances of conventual life. Her own account of her mental and spiritual condition is interesting from the first; but it was not till 1555 that a change of heart and of purpose came, which was as complete and decisive as her former condition had been purposeless or fluctuating. After a time her religious exercises reached a most extraordinary degree of asceticism. Her prayers were almost continual, and she was reported to be favored with visions, ecstacies, and other supernatural visitations. The fame of her sanctity spread not only throughout Spain, but into almost every part of the Church. By some the reality of the reported supernatural favors which were ascribed to her was called in question; and there were even some who threatened to invoke the rigorous investigation of the Holy Office; but the popular voice was freely accorded to her, and the authority of St. Francis Borgia, St. Peter of Alcantara, and other influential churchmen eventually disarmed the opposition.

The most notable and permanent fruit of the enthusiastic spirituality of Teresa is the reform of the Carmelite order, of which she became the instrument. She commenced this work in concert with a few zealous members of her own sisterhood in the convent at Avila, where she had resided from the date of her profession; but after a time she obtained permission from the Holy See to remove with her little community to a humble house in the same city, where she reëstablished in its full rigor the ancient Carmelite rule, as approved by Innocent IV. in 1247, with some additional observances introduced by herself. This new convent of St. Joseph's was established in 1562, in which year she assumed the name of Teresa de Jesus; and in 1565 she obtained from the Pope, Pius IV., a formal approval for the rule as modified by her. For two years Teresa lived in great privacy and quiet in her convent; but in 1567 the general of the Carmelite order, F. Rubeo, was so struck, during his visitation of the convents at Avila, with the condition of that over which

Teresa presided that he urged on her the duty of extending throughout the order the reforms thus successfully initiated. Teresa entered on the work with great energy, and though she met with much opposition, nevertheless succeeded in carrying out her reforms.

In 1579 the Carmelites of the strieter observance established by Teresa were released from the jurisdiction of the old superiors, and united into a distinct association, with a separate head and a distinct organization which was approved in 1580 by Pope Gregory XIII. Under this new constitution the association flourished and extended; and within her own lifetime no fewer than 17 convents of women and 16 of men accepted the reforms which she had originated. Teresa died at Alba, Oct. 4, 1582, and was canonized by Gregory XV. in 1622, her feast being fixed on Oct. 15. She left a number of works, which have at all times maintained a high reputation among a large section of her own Church; their merits are also acknowledged by non-Catholic writers. They consist of ascetical and mystical treatises, instructions in the conventual life, meditations, besides a large number of letters which possess remarkable literary merit. The best-known treatises are her autobiography, "The Way of Perfection," "The Book of the Foundations," and "The Interior Castle." Her works in the original Spanish fill two folio volumes (Salamanca, 1587), and they have been in whole or in part translated into almost every European language. Her life occupies nearly an entire volume of the "Acta Sanctorum," and several biographies have been written in Spanish, French, Italian, German and English.

Tergant, or **Tergiant,** in heraldry, showing the back part; as an eagle tergant displayed.

TERGANT.

Tergeste. See TRIESTE.

Tergestum. See TRIESTE.

Terhune, Albert Payson, an American journalist; born in Newark, N. J., Dec. 21, 1868; was graduated at Columbia University in 1893; and after traveling through Syria, where he investigated the leper settlements and lived among the Bedouins of the desert, returned to New York and joined the editorial staff of the New York "World." He was the author of "Syria from the Saddle"; "Columbia Stories"; "Paul Dufour, Bohemian"; "Dr. Dale: a Story Without a Moral"; and several short stories and poems.

Terhune, Mary Virginia, an American author; born in Amelia co., Va., Dec. 21, 1831; received an academic education, and early began to write for the press. She contributed extensively to numerous magazines; was for several years the editor of "Babyhood" and "The Home Maker"; conducted departments in "Wide Awake" and "St. Nicholas"; and served on the editorial staff of the Chicago "Daily News." Her publications include: "The Story of Mary Washington"; "The Cottage Kitchen"; "Handicapped"; "A Gallant Fight"; "A Story Without a Moral"; etc.

Term, a limit; a boundary; a bound; a confine; the extremity of anything; that which limits its extent. The limitation of an estate; or, rather, the whole time or duration of the holding of an estate. The time in which a court is held or open for the trial of causes. The time during which instruction is regularly given to students in universities and colleges. A word or expresson; the word by which a thing is expressed; that which fixes or determines ideas; a word or expression that denotes something peculiar to an art. The subject or predicate of a proposition in logic. In algebra, a member of a compound quantity. In the plural, conditions; propositions stated or promises made, which, when assented to or accepted by another, settle the contract and bind the parties.

Termagant, the name of one of the idols whom the Saracens are represented in mediæval romances as worshiping. He was afterward introduced into the old Moralities as a person of violent temper, so that a ranting actor might appear to advantage in that character. The word, in common usage, means a turbulent, brawling, scolding or abusive person.

Termes. See TERMITES.

Terminalia, in Roman antiquities, a festival celebrated annually on Feb. 23, in honor of Terminus, the god of boundaries. It was then usual for peasants to assemble near the principal landmarks which separated their fields, and, after they had crowned them with garlands and flowers, to make libations of milk and wine, and to sacrifice a lamb or a young pig. The public festival was celebrated at the sixth milestone on the road to Laurentum, because at one time that was the limit of Roman territory.

In botany (as a pseudo-singular), the typical genus of *Terminaleæ*. Trees and shrubs with alternate leaves, usually crowded at the end of the branches. Inflorescence in racemose and panicled spikes, generally hermaphrodite in their lower part, and only staminiferous above; calyx campanulate, five-cleft, the lobes acute; corolla wanting; stamens 10; ovary with two ovules; drupe with but one seed. From the tropics of Asia and America. *T. chebula* is a large and valuable tree, 80 to 100 feet high, growing in India and Burma.

The fruit is ellipsoid or obovoid and five-ribbed, from three-quarters of an inch to an inch and a quarter in length. The pounded rind gives the black myrobalan. The bark of the tree is used for tanning and dyeing. There are often galls on it, which are also used for dyeing. Another of the Myrobalans is *T. belerica*, 60 or 80 feet high. It grows in India. The leaves and the fruit are used for tanning and dyeing. Other Indian species said to be used for tanning and dyeing are *T. arjuna*, *T. catappa*, *T. citrina*, *T. paniculata*, and *T. tomentosa*. The fruits of *T. catappa*, sometimes called the almond, are eaten; so are the kernels of *T. chebula*, which, however, if taken in large quantities, produce intoxication. A gum like gum arabic is exuded from its bark. *T. chebula* was believed by the old Hindus to be alterative and tonic. The fruits of *T. belerica* are astringent and laxative; the other Indian species are also medicinal. The milky juice of *T. benzoin* becomes fragrant on being dried. It is burnt in churches in Mauritius as a kind of incense. A drastic resin flows from *T. argentea*, a Brazilian species. The root of *T. latifolia* is given in Jamaica in diarrhœa. The bark of *T. alata* is astringent and antifebrile. The wood of *T. tomentosa*, when polished, resembles walnut, and has been used in India for making stethoscopes.

Terminal Velocity, in the theory of projectiles, the greatest velocity which a body can acquire by falling freely through the air, the limit being arrived at when the increase of the atmospheric resistance becomes equal to the increase of the force of gravity.

Terminator, the bounding line between light and darkness on the surface of a planet or of the moon. On the latter this line is a very ragged one, on account of the rough character of the moon's surface.

Termini, a seaport on the N. coast of Sicily; 23 miles E. S. E. of Palermo. The industries are tunny and sardine fishing. The ancient Thermæ Himerenses here was founded by the Carthaginians in 408 B. C., after the destruction of the Greek city of Himera. Under the Roman rule it flourished through its baths. Of these some fragments still exist, as well as of a theater, an aqueduct, etc.

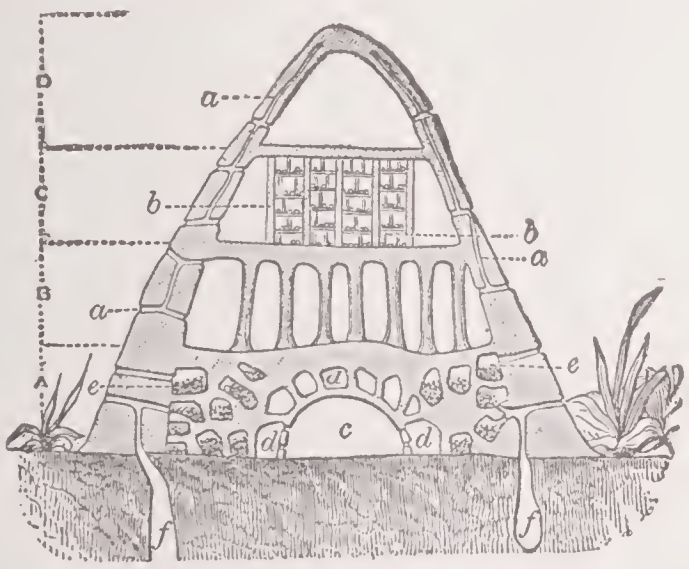
Terminism, in Church history, the belief that there is a terminus in each man's life, after which he is no longer capable of receiving grace or pardon for his sins. This doctrine occasioned a controversy at Leipsic in the 17th century, the chief movers in which were Reichenberg, who upheld the doctrine, and Ittig, who denied it. In philosophy, the same as NOMINALISM (*q. v.*).

Terminus, in mythology, a divinity among the Romans supposed to preside over boundaries, frontiers, and landmarks. He was represented with a human head and neck, placed on a plinth, or column, and being destitute of legs or arms, was thus supposed to testify his immovable and steadfast character.

Termites (*Termitidæ*), a family of insects in the order *Corrodentia*, or, according to some systems, *Pseudo-Neuroptera*. They are often called "white ants," but ants are hymenopterous insects, and do not occur before Tertiary times, whereas the termites seem to have lived from Carboniferous ages onward. Yet, like the ants, the termites are social insects, living in colonies and building "nests," or "hills." They are widely distributed in tropical countries, but they also occur in the temperate parts of North and South America, and a few have established themselves in Europe. As their food consists for the most part of wood, especially in a state of incipient decay, they help many trees to their fall, and they are destructive pests in human dwellings. As they form earthen tunnels up the stems and branches of the trees which they attack, and as the rains wash down these constructions, it seems just, as Henry Drummond points out, to recognize that termites, like earthworms, may help in making the fruitful soil. The termite society consists for the most part of wingless, sexually immature individuals, children, potentially of both sexes, which do not grow up. Besides these workers there is a less numerous caste of large-headed, strong-jawed soldiers. "They stand," Drummond says, "or promenade about as sentries, at the mouths of the tunnels. When danger threatens, in shape of true ants, the soldier termite advances to the fight. With a few sweeps of its scythe-like jaws it clears the ground, and while the attacking party is carrying off its dead, the builders, unconscious of the fray, quietly continue their work." The workers collect food, form burrows and tunnels, build "hills," and care for the males, females, eggs, and larvæ. The males and females have wings, which the latter lose after impregnation. Then, indeed, the female or queen undergoes a remarkable change, becoming enormously distended with eggs and sometimes attaining a length of two to five inches or more—"a large cylindrical package, in shape like a sausage, and as white as a bolster." As only the abdomen swells, the resulting disproportion between anterior and posterior parts is very striking. The queen is extremely prolific, having been known to lay 60 eggs in a minute, or about 80,000 eggs in a day. In the royal chamber a male is also kept. It is hardly necessary to say that the queen could not leave if she would. But to understand this

imprisonment we must notice that in spring the young winged males and females leave the nest in a swarm, after which pairing takes place; the survivors becoming the imprisoned "rulers" and parents of new colonies.

But Fritz Müller has shown that besides the winged males and females there are (in at least many cases) wingless males and females which never leave the termitary in which they are born, being kept as complementary or reserve reproductive members, useful should not a winged royal pair be forthcoming. Sometimes this casualty occurs, and then the wingless pairs become parents. The complementary kings die before winter; their mates live on, widowed, but still maternal, till at least another summer. Müller points out that, though the production and parentage of wingless males and females involves less mortality, the winged males and females probably cross with those from other nests, thus securing the advantages of cross-fertilization. The workers are diligent in tending the king and queen, in removing the laid eggs, and in feeding the larvæ.



DIAGRAMMATIC SECTION OF A TERMITE'S NEST (AFTER HOUSSAY).

In the walls there are winding passages, *a*, uppermost is a well-aired empty attic, D; the next story, C, is a nursery where the young termites are hatched on shelves, *b*; the next is a hall, B, supported by pillars; beneath this is a royal chamber, *c*, in which the king and queen are imprisoned; around this are the chambers of worker-termites, *d*, and some store-chambers, *e*; excavated in the ground are holes, *f*, out of which the material used in making the termitary was dug.

In general appearance and size a wingless termite is ant-like, but the winged forms are much larger and flatter, and their wings are quite different. The workers have large broad heads and strong jaws adapted for gnawing; the soldiers have still larger heads and longer jaws. Besides the jaws and the two pairs of maxillæ the head bears a pair of beaded antennæ, two eyes, and two ocelli, but the workers and soldiers are blind. The thorax has the usual three segments, and bears simple legs; the abdomen consists of nine segments.

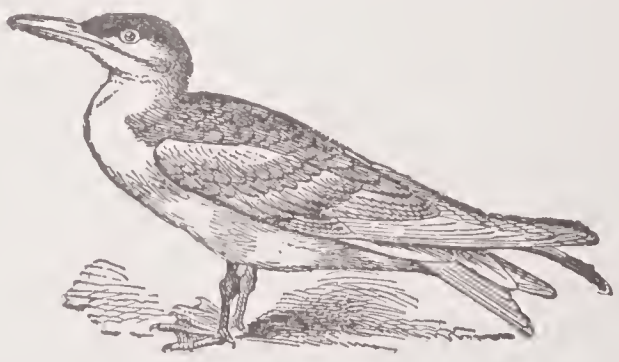
The most remarkable termitaries are those of *Termes bellicosus*, abundant on the W. coast of Africa. They are sugar-loaf-like in shape, 10 to 20 feet in height, and, though built of cemented particles of earth, are strong enough to bear a man's weight. Internally, as the figure shows, there are several stories and many chambers, some for the workers, one for the king and queen, others for the eggs and young, others for storing supplies of compacted minced wood. But the termites do not all build such gigantic nests; for some build their homes on the branches of trees and apparently out of masticated woody material.

In Africa *T. bellicosus* and *T. arborum* are common species; in North America *T. flavipes* is very common. A few species — *T. lucifugus*, *T. flavicollis*, and *T. flavipes* — all probably introduced — occur in Europe. Besides *Termes* there are other genera, such as *Eutermes*, *Calotermes*, and *Anoplotermes*.

The termines seem to be of use in destroying decaying wood and in loosening the soil. They also afford food for ant eaters and other insectivorous mammals and for birds. But to dwellers in warm countries they are pests, destroying the timbers of houses and all sorts of wooden furniture. Effecting entrance from underground, they hollow out the interior, leaving only a deceptive shell, which at length collapses. Even in Europe *T. lucifugus* has proved very destructive in some parts of France, notably in the navy yard of Rochefort. Yet to the naturalist their social life, their reproductive relations, and their architectural instincts are most interesting marvels demanding further research.

Termonde. See DENDERMONDE.

Tern, in ornithology, the popular name of any species of the genus *Sterna*. They are slenderly built birds, with long, narrow,



THE EUROPEAN TERN.

sharp-pointed wings, and forked tail, from which, as well as from their swift and circling manner of flight, they are often called sea swallows. The thick, soft, close plumage is colored light blue, black, and white, varying but little with sex, age, or season of the year. They are extensively distrib-

uted, inhabiting every zone, but prefer warm and temperate climates to the colder regions, which they only visit for a short period during the year. All are exceedingly active, and from sunrise to sunset are on the wing, generally flying very near the surface of the water, rising and sinking as the waves heave and fall. They walk badly and are not good swimmers, their small feet rendering them but little assistance, so that they are tossed about like corks. They feed on small fish and marine animals, always taking their prey on the wing.

Ternate, one of the Molucca Islands, area, about 25 square miles; contains a remarkable volcano (5,600 feet), and produces tobacco, cotton, sago, sulphur, saltpeter, etc. The town Ternate is the seat of a native sultan and of the Dutch resident.

Terne Plate. See TIN PLATE.

Terni, a cathedral town in Central Italy; between the two arms of the Nera; 70 miles N. N. E. of Rome. About 2 miles off is the famous cataract of Velino, 500 feet high, celebrated by Byron in his "Childe Harold." Terni is the ancient Interamna Umbrica, perhaps the birthplace of Tacitus.

Ternina, Milka, a German dramatic soprano; born in Vezisce, Croatia, in 1863. After studying under Dr. Josef Gansbacher, of Vienna, she acquired experience in Leipsic, Graz, and Bremen. In 1890 she became prima donna in Munich, where her success was great. Her talents were recognized throughout Germany, and she was a favorite in Russia and America. She first appeared in England at Covent Garden Opera House as Isolde in 1898, and further attracted attention by exceptionally fine impersonations of Brünnhilde and Fidelio, appearing in the former rôle with great success in New York city during the season of 1896.

Ternstrœmiaceæ, a natural order of polypetalous dicotyledonous plants, consisting of trees or shrubs, with alternate simple usually coriaceous leaves without stipules. The flowers are generally white, arranged in axillary or terminal peduncles, articulated at the base. This order is one of great economical importance, as it includes the genus *Thea*, from which the teas of commerce are obtained. The favorite garden camellia also belongs to it. The plants belonging to the order are principally inhabitants of Asia and America.

Terpenes, in chemistry, a term applied to a series of hydrocarbons having the generic formula $CnH_2n - 4$. They may be all classed under two heads, those produced by synthetical means, as valylene, C_5H_6, and carpene, C_9H_{14}; and those found ready formed in plants, as the turpentines, $C_{10}H_{16}$. With the exception of the last, the terpenes have been very incompletely investigated. They are colorless or yellowish liquids, are insoluble in water, but soluble in alcohol, ether, chloroform, benzene, and in the fixed and volatile oils.

Terpilene, an inactive hydrocarbon, produced by the action of weak reagents on the solid dihydrochloride, $C_{10}H_{16} \cdot 2HCl$.

Terpine, formula, $C_{10}H_{20}O_2H_2O$, a crystalline body, obtained by shaking for some time a mixture of eight parts oil of turpentine, two parts dilute nitric acid, and one part alcohol. It forms large, brilliant, colorless, short, rhombic prisms, soluble in boiling water, alcohol, and ether, melts at 103°, and sublimes at a higher temperature in long needles.

Terpinol, formula, $C_{20}H_{34}O$; a liquid of hyacinth-like odor, produced by heating an aqueous solution of terpine with hydrochloric and sulphuric acids. It boils at 168°, and has a sp. gr. .852.

Terpodion, in music, a keyed instrument invented by John David Buschmann, of Hamburg about 1816, resembling a pianoforte in appearance, but producing notes from blocks of wood struck with hammers. The sound could be increased or diminished at pleasure.

Terpsichore, in classical antiquities, one of the muses, daughter of Jupiter and Mnemosyne. She presided over dancing, of which she was reckoned the inventress, and in which, as her name intimates, she took delight. To her was sometimes ascribed the invention of the cithara, rather than to Mercury. She is represented as a young virgin crowned with laurel, and holding in her hands a musical instrument.

Terrace, a raised level space or platform of earth, supported on one or more sides by masonry, a bank or platform of turf or the like, such as may be seen in gardens, where they are used for ornament, cultivation, or promenade. In physical geography and geology, a platform, often of soft material, flat above, and more or less steep on the sides. They often mark where the bed of the ocean or of a lake was successively situated during the intervals between elevatory movements.

Terra=Cotta, an Italian term for pottery or earthenware. The name is not ordinarily applied to pottery vessels with thin walls, but is confined to statues, statuettes, basreliefs, and architectural members such as columns, cornices, friezes, consoles, and the like made of burnt clay. But the term is not necessarily confined to articles of a decorative character. The color of terracotta is either buff, yellow, or red, the former being the more common. Many masterpieces of ancient Greek and Roman

sculpture are executed in this material, and a considerable number of works in burnt clay, by Italian artists who lived in the Middle Age and early Renaissance periods, are also exquisite productions. Architectural ornaments of a very effective kind were also executed in this material in ancient times.

Distinguished modern sculptors sometimes produce works in terra-cotta, and for the last 30 or 40 years it has been increasingly employed, either partly or wholly, for the fronts and other portions of important buildings. Terra-cotta is peculiarly well

TANAGRA TERRA-COTTA.

suited for architectural work in towns where stone too readily decays, or in cities to which stone has to be brought from a long distance. Berlin is thus remotely situated, and in that city many large and highly ornate modern buildings are executed in this material.

Terra del Fuego. See TIERRA.

Terra di Lavoro. See CASERTA.

Terra di Sienna, a ferruginous, ocherous earth, used as a pigment in both oil and water-color painting in its raw state and when burnt. In the latter instance it becomes of a deep orange tint, and dries more rapidly. It is transparent and durable; mixed with various blues, it yields many useful tints of green.

Terrapin, the popular name of several species of fresh-water or tide-water tortoises constituting the family *Emydæ*, distinguished by a horny beak, a shield covered with epidermic plates, and feet partly webbed. They are active in their habits, swimming well and moving with greater agility on land than the land tortoises. They are natives of tropical and warmer temperate countries, many being natives of North America. They feed on vegetables, fish, reptiles, and other aquatic animals. Their flesh is much esteemed. One species, called the salt-water terrapin (*Malachlemys concentrica*), is abundant in the salt-water marshes around Charlestown. The chicken tortoise (*Emys reticularia*), so named from its flavor, is also an esteemed American species.

In the United States terrapin have become so scarce that several "farms" have been started for their culture. One of these farms is at Beaulieu, Ga. P. M. Strong, the manager of this farm, in speaking of his farm and its inhabitants, says: "The terrapin is gradually disappearing. The Chesapeake Bay terrapin, that is so highly vaunted, has practically left us. There are very few of them now obtainable, and the greater portion of the terrapin now eaten in Maryland are the black stocks from South Carolina. Our black stock are fast reaching this point, though we certainly hope to postpone the ultimate extinction for many a day yet.

"Our terrapin 'crawls' at Beaulieu produce more terrapin probably than any other crawl in the country. I think, by the way, that there is but one other, and that is on the Eastern Shore, near Crisfield. Our crawls are right on the river. The larger is 310 by 60 feet and is divided into three compartments for three sizes. The smaller crawl is for the baby terrapin and is 100 by 8 feet. Through both crawls there is a 'trunk,' or ditch, running, connected with the river, making a circuit of the farm and returning to the river again. The bottom of the crawls is on a level with the low tide and is covered with a layer of mud about six inches deep. Into this the terrapin burrow in winter and remain the best part of the time. Floodgates are at the opening of both crawls, so we can let in or out the water at will. Our average population of terrapin is about 40,000, one-half bulls and the other half heifers.

"The feeding of the terrapin is a puzzling thing. I have not yet found whether it is necessary for a terrapin to eat at all. Once I made an experiment and put a number of terrapin in a separate crawl, kept them there for a year and gave them absolutely nothing to eat. At the end of

that time I took them out and found that many of them were in just as good condition as those I had been feeding all the year. However, we feed them. We give them exclusively shrimp and crabs to eat. They will take most anything you give them, but these two things I have found, improve the flavor immensely. Our 40,000, I should say, on an average consume 20 bushels of shrimp and crab a day. If you stop feeding them it does not seem to worry them at all. The young ones we feed hardly at all, as they appear to pick up more nourishment from the mud than anything else. We have an army of darkies employed to catch the crabs and shrimp for us, and all along the river there are lines out daily.

"The terrapin is a hardy beast and there is but one way of killing him. In the first place you have to arm yourself with a knife and fork. Then put your terrapin down on the floor. In a minute or so he will start walking and poke his head out. Then, coming from behind, you want to jab the prongs of your fork down over his neck between the head and the shell, fastening him to the floor. Next, all you have to do is to use your knife and saw his head off. You can't kill a terrapin by cold. I have seen terrapin placed in the center of a block of ice and frozen fast to it. They have been left there four or five days, then chopped out, thawed a while by the fire and in a short time were as lively as ever. It takes a terrapin seven years to attain his full growth, and while the length of his days is a matter of dispute, I believe they live 25 or 30 years. The heifer lays from 8 to 12 eggs three times a year, in April, May, and June. It takes these eggs six weeks to hatch. The baby terrapin is just about as big as the end of your thumb. At one end of our large crawl we have a board like a chicken roost, on which the terrapin can crawl into a sand pit, where they lay their eggs. It is necessary to be very careful and get the baby terrapin away from their parents as soon as they hatch, else they will be eaten on the spur of the moment. It does not do to expose the young terrapin to the cold like the old chaps, as they are not hardy enough to stand it without suffering.

"Terrapin have a certain amount of intelligence and a very large amount of curiosity. Through this prominent trait they are captured. The best way of catching terrapin is for two men to go out in a rowboat with a net. They row carefully along till they come to a likely spot for terrapin. Then one man gets a stick and raps sharply on the side of the boat several times. If there are any terrapin around they will come to the surface just as fast as they can get there to see what is going on. Then the other man scoops them up with his little net. Another way, used in the salt marshes, is for the darkies to go tramping through the mud and water, sometimes up to their waists. If they pass any terrapin these will rise out of the mud to see what the disturbance is. I have agents all along the coast who collect from the darkies and fishermen in their territory all the terrapin that are caught. Then I make periodical trips in a boat and bring them all in to the crawl. There they are fattened and kept till sold. Terrapin certainly have as much sense as chickens, though no one would choose one for a pet. When the men go in to feed them they whistle, and terrapin from all over the crawl, thousands of them, come swimming through the water, piling over each other in their efforts to get close to the man with the shrimp and crabs."

Terrasson, Jean, a French author; born in Lyons in 1670. He wrote "Sethos," a sort of philosophical novel, which contains some curious details regarding the customs of ancient Egypt, and the initiations into the religious mysteries (3 vols. 1731); "Dissertation on Homer's Iliad" (1715); "Justification of the India Company" (1720). He died in Paris, 1750.

Terraverde, a name given to two kinds of native green earth used as pigments in painting; one obtained from Monte Baldo, near Verona, the other from the island of Cyprus. The former has much more body than the latter, and is very useful in landscape painting in oil colors. It is a siliceous earth colored by the protoxide of iron, of which it contains about 20 per cent. It is not affected by exposure to strong light or impure air.

Terre Haute, a city and county-seat of Vigo co., Ind.; on the Wabash river, and on the Vandalia, the Chicago and Eastern Illinois, the Evansville and Terre Haute, the Cleveland, Cincinnati, Chicago, and St. Louis, and other railroads; 73 miles W. of Indianapolis. The city is built in a farming section, near the extensive block coal mines of Clay county. It contains the Rose Polytechnic Institute, the State Normal School, Coates Female College, St. Mary's Institute (R. C.), the Rose Dispensary, Rose Orphan Home, Old Ladies' Home, St. Ann's Orphan Asylum, St. Anthony's Hospital (R. C.), Union Home for Invalids, court house, United States government building, several libraries, National, State, and savings banks, and several daily, weekly, and monthly periodicals. The city has waterworks, a sewer system, well paved streets, and street railroad and electric light plants. Terre Haute is an important manufacturing city, having flour and hominy mills, rolling mills, distilleries, blast furnaces, tool factories, breweries, nail works,

paving brick, and other clay works, railroad car shops, and a number of large grain elevators. The assessed property valuation is nearly $20,500,00. Pop. (1890) 30,217; (1900) 36,673; (1910) 58,157.

Terrell, Edwin Holland, an American diplomatist; born in Brookville, Ind., Nov. 21, 1848; was graduated at De Pauw University in 1871; studied in Europe in 1873–1874; and practised law in Indianapolis in 1874–1877. He was a delegate to the Republican National Conventions, from Texas in 1880 and 1888; United States minister to Belgium in 1889–1893; conducted the negotiations for the United States with the six powers holding possessions in the Kongo basin and secured from them the "Protocol" of Dec. 22, 1890, granting the United States and its citizens full commercial privileges, etc. He was minister plenipotentiary to negotiate commercial treaty with the Kongo Free State in 1891; commissioner to and vice-president of the International Monetary Conference at Brussels in 1892; and was a member of the Republican State Executive Committee of Texas in 1894–1900.

Terreplein, in fortification, the top, platform, or horizontal surface of a rampart, on which the cannon are placed.

Terrier, a name originally applied to any breed of dog used to burrow underground, but now applied to any small dog. Terriers may be divided into three classes: those able to follow their game into its earth, those kept for hunting above-ground, and those kept merely as companions. Among terriers proper the fox terrier holds the position of greatest popularity. The Scotch terrier, though long familiar in Scotland, only became generally known about 1870, but is spreading so rapidly that it threatens even the popularity of the fox terrier. The Scotch terrier is identical with the breed often erroneously alluded to as the old or working Skye terrier. He is a small, compact dog, short in the leg; coat short, hard, and dense; ears erect; and with a keen, bright expression. In character he is generally alert and active, and makes a splendid companion. The third variety used for going to ground is the Dandie Dinmont, called after the character in Scott's novel of "Guy Mannering," a character founded on Mr. Davison, a well-known Border farmer, who was one of the founders of the breed. The Dandie is a low and powerful dog, very courageous, a quality probably gained by an admixture of bulldog blood, but headstrong and difficult to keep under control. Dandies are divided into "peppers" and "mustards" — *i. e.*, those colored slate-blue and those of a light yellow. The coat is rather longer than the Scotch terrier, but not so hard.

Among terriers kept for hunting above ground the most popular is the Irish terrier, a dog larger and considerably leggier than the fox terrier, but built on the same lines. The coat is like the Scotch terrier's, but a light red in color. The ears used always to be cut to a fine point, standing erect, but are now allowed to fall over in their natural shape. The Bedlington is popular in the N. of England; the bull terrier also makes a good sporting dog, but is kept mainly as a companion. The Airedale is growing in popularity, but its large size (some specimens weigh 60 pounds) unfit it for any proper terrier work. It somewhat resembles an overgrown blue Bedlington, but lacks the same courage. Among terriers kept as companions the Skye is probably the most common. The black-and-tan terrier, though a breed of great antiquity, is fast being supplanted by the white English terrier. Both breeds are identical in shape and resemble a light and elegant bull terrier. The toy terrier is a cross from the black-and-tan, as is the Yorkshire terrier. Both varieties are fit only for house dogs and are not true terriers.

Territory, a term applied in the United States to an area similar to a State of the Union, but not having the independent position of one. The unorganized Territories are under the direct control of Congress. Each organized Territory has a governor, appointed by the President, for four years and ratified by the Senate. The Legislature, officially known as the Legislative Assembly, is composed of a council and a house of representatives, chosen every two years by the people. A delegate to Congress is elected for the same term. He has the right of debate, but not a vote in the House. Territorial legislation is subject to Congressional control. Territorial courts are provided for, the judges of which are appointed by the President for four years, and confirmed by the Senate, and over which the Supreme Court of the United States has appellate jurisdiction. Territories are usually admitted as States on attaining a sufficient population.

Terror, Reign of, the term usually applied to the period of the French revolutionary government from the appointment of the revolutionary tribunal and the committee of public safety (April 6, 1793) to the fall of Robespierre (July 27, 1794).

Terror, The, one of the vessels which accompanied the ill-fated Arctic exploring expedition under Sir John Franklin in 1845. From documents found on King William's Land by Captain McClintock, it is known that Franklin died in 1847, and that the ships "Erebus" and "Terror" were deserted by the remainder of the explorers who started for the Great Fish river. They all perished and no traces of the vessels were ever found. See FRANKLIN, SIR JOHN.

Terror, The, a twin-screw, iron, double-turreted monitor of the United States navy; 3,390 tons displacement; length 259 feet 6 inches; breadth, 55 feet 10 inches; mean draft, 14 feet 6 inches; horse power 1,600; armor, 7 inches on sides and 11.5 inches on turrets; main battery, four 10-inch breech-loading rifles; secondary battery, two 6-pounder and two 3-pounder rapid-fire guns, two Gatlings and two 37-millimeter Hotchkiss revolving cannons; speed 12 knots; crew, 15 officers and 136 men; cost, $3,178,046.

Terry, Alfred Howe, an American military officer; born in Hartford, Conn., Nov. 10, 1827; studied law at Yale College and began its practice in 1848. From 1854 to 1860 he was clerk of the Superior and Supreme Courts of Connecticut. At the outbreak of the Civil War he was colonel of a regiment of militia, which was mustered for the United States service in the first call for volunteers with Terry still at its head. In April, 1862, he was made a Brigadier-General of volunteers, and served in the operations about Charleston, and in the siege operations at Forts Wagner and Sumter. He commanded a division in the Virginia campaign of 1864, having command of a corps from May to July. He was in charge of the expedition which captured Fort Fisher in January, 1865, for which he was made a Major-General of volunteers, and Brigadier-General in the regular army, receiving also the thanks of Congress. In March, 1865, he was placed in command of the 10th Corps, and in June, of the Department of Virginia. From 1869 to 1872 he was at the head of the Department of the South, and after 1872 had charge of various divisions and departments of the army. In March, 1886, he was promoted to the major-generalship, made vacant by the death of General Hancock, and in the following April took command of the Department of the Missouri. He retired in 1888, and died in New Haven, Conn., Dec. 16, 1890.

Terry, Ellen Alice, an English actress; born in Coventry, England, Feb. 27, 1848, and made her first appearance on the stage during Charles Kean's Shakespearian revivals in 1858, playing the parts of Mamillius in "The Winter's Tale" and Prince Arthur in "King John." When only 14 she was a member of Mr. Chute's Bristol Company, which included Miss Kate Terry, Mr. William Rignold, Mr. George Rignold, Mr. Charles Coghlan, Mrs. Kendal, Mrs. Labouchere, Kate Bishop, and several other now prominent members of the profession. She reappeared in London, March, 1863, as Gertrude in "The Little Treasure," and till January, 1864, played Hero in "Much Ado about Nothing," Mary Meredith in "Our American Cousin," and other secondary parts. In that year she married and left the stage, but reappeared again in October, 1867, in "The Double Marriage" at the New Queen's Theater, London. She afterward joined Mr. and Mrs. Bancroft at the Prince of Wales' Theater, where she acted the part of Portia. On Dec. 30, 1878, she made her first appearance at the Lyceum, and, in conjunction with Mr. Irving, played in the longest runs ever known of "Hamlet," "The Merchant of Venice," "Romeo and Juliet," and "Much Ado about Nothing." She also appeared as Viola in "Twelfth Night," Henrietta Maria in "Charles I.," Camma in Tennyson's tragedy of "The Cup," Ruth Meadows in "Eugene Aram," as Marguerite in W. G. Wills' "Faust" (revived in 1849), as Lady Macbeth in "Macbeth," as Lucy Ashton in "Ravenswood," as Queen Catherine in "Henry VIII.," as Cordelia in "King Lear," as Rosamonde in "Becket" (1893), as Imogen in "Cymbeline" (1896); as Madame Sans-Gêne (1897); and in "Peter the Great" (1898). She accompanied Mr. Irving on his numerous American tours, playing with unprecedented success all over the United States.

Terry, Henry Tayler, an American lawyer; born in Hartford, Conn., Sept. 19, 1847; was graduated at Yale College in 1869, and admitted to the Connecticut bar in 1872. In 1878 he became Professor of Law at the Imperial University of Tokyo, Japan, but returned to the United States in 1884, and began the practice of his profession in New York city. In 1894 he resumed his chair in the Imperial University. His publications include: "First Principles of Law," "Leading Principles of American Law," "The Common Law," etc.

Terry, Milton Spenser, an American educator; born in Coeymans, N. Y., Feb. 22, 1840; was graduated at Troy University and the Yale Divinity School; held pastorates in various Methodist Episcopal churches in New York city in 1863–1884; and in 1885 was made Professor of Christian Doctrines in the Garret Biblical Institute, Northwestern University. He was the author of "Commentary on the Old Testament," "Biblical Hermeneutics," "The Sibylline Oracles," "Rambles in the Old World," "Biblical Apocalyptics," etc.

Terry, Silas Wright, an American naval officer; born in Kentucky, Dec. 28, 1842; was appointed to the navy in 1858. At the outbreak of the Civil War he was assigned to the "Dale" in the Atlantic Coast Blockading Squadron, in which he served till 1863, when he was transferred to the "Black Hawk," of the Mississippi Squadron. Soon afterward he was placed in command of the transport "Benefit" to carry dispatches and supplies to Admiral Porter; and for gallant service in the execution of this commission he was advanced five num-

bers and appointed to the staff of Admiral Porter, under whom he served till the close of the war. Afterward he cruised on the "Ticonderoga" in European waters; was executive officer on the flagships "Severn" and "Worcester"; inspector of the Maryland Lighthouse District; and commanded the "Marion," attached to the South Atlantic Squadron. In 1887 he went to Washington, D. C., where he was engaged on board duty till 1892. He was promoted captain in 1893, and during the American-Spanish War commanded the receiving ship "Franklin" at Norfolk. He was made commander of the navy yard at Washington, D. C., March 24, 1900; and on March 29, following, was promoted rear-admiral.

Terschelling, an island of the Netherlands; 10 miles off the coast of Friesland, between the islands of Vlieland and Ameland. It is about 15 miles long by 3 broad, is flat and sandy, and exposed in some parts to inundation. The inhabitants are chiefly pilots and fishermen.

Tersteegen, Gerhard, a German poet; born in Mörs, Germany, Nov. 25, 1697. Among his works are: "The Spiritual Garden" (1729); "Crumbs" (1773). Among his religious songs and hymns the more notable are: "Shout, ye Heavens, for Joy," and "Now the Day is Ended." He died in Mühlheim, on the Ruhr, April 3, 1769.

Tertiaries, a name given by Church writers to a class in the Roman Catholic Church, who, without entering into the seclusion of a monastery, aspire to practise in ordinary life all the substantial obligations of the scheme of virtue laid down in the Gospel. It was under St. Francis and the mendicant orders generally that the institute of Tertiaries reached its full development. Similar lay associations were organized in connection with the Dominican, Carmelite, and Augustinian, as well as with certain of the more modern orders; and a brotherhood of the same character had already been formed by the Templars. The institute of Tertiaries, properly so called, is quite distinct from that of the lay "confraternities" which exist in connection with the several orders, and the objects of which are very similar.

Tertiary, a color, as citrine, russet, or olive, produced by the mixture of the two secondary colors. More correctly speaking, they are grays, and are either red-gray, or yellow-gray, when these primaries are in excess, or they are violet-gray, orange-gray, or green-gray, when these secondaries are in excess. In ecclesiastical affairs, a member of a Third Order, whether living in the world or in community.

In geology, the third leading division of fossiliferous sedimentary rocks; called also the Cainozoic or Kainozoic. The succession and importance of the Primary (Palæozoic) and the Secondary (Mesozoic) rocks were understood before the nature and extent of the Tertiary were recognized, these last strata being confounded with the superficial alluviums. They were observed to occur in patches (some of fresh-water and others of marine origin) in small areas or basins in the Secondary rocks, suggesting the idea that they had been deposited in bays, lakes, estuaries, or inland seas, after a great part of what is now Europe had been converted into dry land. The first properly understood strata of Tertiary age were those in the vicinity of Paris, described by Cuvier and Brongniart in 1810. Other Tertiary strata were shortly afterward discriminated in England, in London, in Hampshire, in Suffolk, in the Subapennine hills in Italy, near Bordeaux and Dax in the S. of France, and elsewhere. These several deposits were found to be not quite contemporaneous, and there arose a division, which continued till 1833, into the Lower, Middle, and Upper Tertiary. But as early as 1828, Mr. (afterward Sir Charles) Lyell had conceived the idea that the Tertiary strata might be classified by the percentage of extinct species of shells which they contained. He found in 1829 that Deshayes of Paris, had independently come to the same conclusion, and the latter geologist, after comparing 3,000 fossil with 5,000 living shells, intimated that in the Lower Tertiary strata about 3½ per cent. of the species were identical with recent ones; in the Middle Tertiary about 17 per cent.; in the Upper Tertiary, in the oldest beds 35-50, and in the more modern ones 90-95 per cent. To these three Lyell gave the names Eocene, Miocene, and Pliocene respectively, words which have since gained universal currency. The foregoing percentages are now known to be only approximately accurate. Next the newer Pliocene beds were called by Lyell Pleistocene, a name afterward transferred to the Post Tertiary, and Oligocene was proposed by Beyrich for beds intercalated between the Eocene and the Miocene. A gap, as yet only partially filled, occurs be- the Chalk and the Eocene. This gap has been utilized to draw a natural line between the Secondary and the Tertiary beds. It probably arose from an upheaval of the sea bed. Thus, with the Eocene, as the name imports, the dawn of the present system of things began, and the percentage of shell species shows that the transition has gone on without stoppage or hiatus till now. Other classes present evidence of the same kind; but, as Lyell was the first to point out, which he did in 1830, Shell species have a longevity far exceeding that of the Mammalia. No recent mammal appears in the Eocene, though in Eocene strata various mammalian families which have well-known living representatives appear for the first time. Among animals the Tertiary is the

age of Mammals; among plants it is the age of Dicotyledons, the Cycads and Conifers of the Upper Secondary rocks having given place to plants belonging to many orders and a vegetation only less varied than now. (For tertiary volcanic rocks, see VOLCANIC). Murchison says that gold is generally wanting in the Tertiary.

Also in geology, the period of time during which the Tertiary strata were deposited. It cannot yet be measured even approximately. When it commenced, England, as proved by the fruits in the London clay at Sheppey, was a tropical or sub-tropical country. The temperature fell till the Newer Pliocene, by which time the climate was semi-Arctic. During the deposition of the Tertiary, there was a great increase of land both in Europe and America.

In the plural, in ornithology the tertials; wing feathers having their origin from the humerus. They are a portion of the quills. They are not scapulars, though Cuvier calls them by this name; nor do they cover the scapulars. Their use is to fill up the interval between the body and the expanded wing, and to oppose a broader surface of resistance to the air.

Tertullianus, Quintus Septimius Florens (more commonly, TERTULLIAN), a theologian of the Western Church; born of heathen parents in Carthage about 160. His father was a Roman centurion under the proconsul of Africa. The details of his life are little known, but the strongly marked character of the man comes out in every page of his numerous writings. He had a liberal education, and shows extensive acquaintance with poetry, history and law, and considerable knowledge of philosophy and science, though he calls the philosophers "the patriarchs of heretics" and the learning of secular literature "folly with God." He speaks of the delight he once had in the indecent profanities of the public plays, and confesses that he had fallen into the greatest sins. He nowhere says much about his personal religion, but calls himself "a sinner of all brands, and fit only for penitence, and asks his readers to remember in their prayers Tertullian the sinner." He had sufficient command of Greek to write in that language his earliest treatises, all of which are lost. Jerome mentions that he was a presbyter of the Catholic Church, whether at Rome or Carthage is unknown. Tertullian himself speaks of his having lived at Rome. Eusebius says "he was accurately acquainted with the Roman laws, and one of the most distinguished men in Rome." It is possible that before his conversion he had practised there as an advocate or rhetorician. He did not become a Christian till about 190, and he has not recorded the history of his conversion.

That he was married is shown by his two books "To the Wife," in which he argues against second marriages. Some time between 199 and 203 his opposition to the spirit of worldliness in the Church culminated in his becoming a leader of the Montanist sect. According to Jerome, this was owing to "the envy and insults of the clergy of the Roman Church," but the chief causes were doubtless the uncompromising character of his natural disposition, and his repugnance to the laxity of the Roman clergy in their reception of the *Lapsi*, and very probably the favor shown to the Patripassian heresy by the Roman bishops Zephyrinus and Callistus. He died between 220 and 240, "in decrepit old age" (Jerome). Augustine says that he at last withdrew from the Montanists, and "propagated conventicles of his own," which is rendered less likely by the fact that the Montanist sect survived in Africa till the 5th century, under the name of "Tertullianists."

Tertullian was a man "of an eager and vehement disposition" (Jerome), who threw all his great gifts of learning, imagination, eloquence and wit into the religious controversies of his time for 30 years (190-220). Along with the Roman love for substantiality and strength, he had the "bitter, stern, and harsh temper" which Plutarch ascribes to the Carthaginians. He wanted the sweet reasonableness and calmness, the feeling for harmonious form, and the instinct for speculative thought that distinguish the greatest Greek fathers of the Church. He had the heart of a Christian with the adroit intellect of an advocate. His aim is always to make his adversaries appear ridiculous and contemptible. He pours unsparingly on them a fiery stream of strong argument and satire, mixed with the sophisms, insinuations, and hyperboles of a special pleader. His style is most vivid, vigorous, and concise, abounding in harsh and obscure expressions, abrupt turns, and impetuous transitions, with here and there bursts of glowing eloquence, reminding the reader at one time of Carlyle, at another of Lamennais. What appear to be African provincialisms Niebuhr contends are only words and expressions taken from the ancient Latin writers.

He was the first to give such words as *persona, liberum, arbitrium, trinitas, satisfactio, sacramentum, substantia,* etc., the place they hold in Christian theology. Many sentences of Tertullian's, as, for example, "the blood of the martyrs is the seed of the Church"; "Christ is truth, not custom"; "It is absolutely credible because absurd—it is certain because impossible"; "the human race has always deserved ill of God"; "the unity of heretics is schism"; "it is contrary to religion to compel religion"; "how wise an arguer does ignorance seem to herself to be," have become proverbial. "Who can sufficiently extol the eloquence of Tertullian!" exclaims Vincentius of Leri-

num; "almost every word conveys a thought, every sentence is a victory. He is among the Latins what Origen is among the Greeks — the greatest of all." Like Origen, Tertullian was a man of great genius, sincerity, and zeal, a vigorous ascetic, and an indefatigable worker, and, though wielding great influence over his contemporaries, was never more than a presbyter. Like him, too, this champion of the Christian faith against all opponents, Jews, heathens, and heretics, was himself a heretic to the majority of the Christians of his time. Both show the same contempt of the world and enthusiasm for martyrdom. But in the tendency of their views the contrast between them is as striking as in their natural temper and their literary style.

Tertullian is an intense realist, with leanings toward materialism, Origen a pure idealist. Origen, like Justin, holds that Greek philosophy was "a preparation for the Gospel," "a fragment of eternal truth from the theology of the ever-living Word." Tertullian thinks that "philosophers are blockheads when they knock at the gates of truth," and that "they have contributed nothing whatever that a Christian can accept." "The eloquence of the one," says Prescnsé, "is broad and transparent like his genius: it is a noble, full, majestic river: that of the other is a turbid mountain torrent. Origen speaks to philosophers as a Christian philosopher: Tertullian is a tribune of the people passionately haranguing the crowd in the forum or at the cross roads; he is the ancient orator, with his vehement gestures, his vivid images, his grandiose pathos."

His writings have been called "Tracts for the Times." Most of them are short. They are a rich mine of information as to the relations between Christians and heathens in his time. Though perhaps not the first of the Latin Christian writers, Tertullian was the creator of ecclesiastical Latinity, and impressed upon the language a new character, as he bent it to the service of Christian ideas. His works are divided into three classes:

(1) Controversial writings against heathens and Jews. His "Apologetic" (ed. by Woodham, 1843; by Bindley, 1891), addressed to the Roman authorities, is an attempt to establish the Christian's right to toleration. A popular edition of this work is presented in his two books "To the Nations," possibly, as Uhlhorn and Hauck believe, of earlier date. "To Scapula" is a bold rebuke of the persecuting Roman proconsul Scapula. In his "Concerning the Testimony of the Soul" he acutely develops the thought that Christianity responds to the religious necessities and postulates of human nature. The treatise "Against the Jews" is to prove that prophecy is fulfilled in Christ.

Tertullianus

(2) Against heretics. Against these Tertullian takes his stand, as Irenæus did before him, on the old apostolical tradition as the fixed foundation of belief. He formulates this position juristically in his "Against the Proscription of Heretics." Against the gnostic attempts to volatilize Christianity in gnostic spiritualism he maintained its reality as a practical form of life in his "Concerning Baptism," "Against Hermogernes," "Against Valentinians," "Concerning the Soul" (in which he contends that even the soul is material), "Concerning the Body of Christ" (against Doctism), "Concerning the Resurrection of the Body," and the five books "Against Maicio." Against the Patripassian heresy he wrote the book "Against Praxeas."

(3) Practical and ascetic treatises. It is especially in these writings relating to Christian life and discipline that we can trace Tertullian's increasing hostility to the Church and adoption of the Montanist views, which had great influence among African Christians. He hailed the testimony of "free prophecy" as God's witness against the laxity which the Catholic Church had shown in dealing with the sensual weaknesses of the great multitude within her pale. Hence the division of these treatises into "Pre-Montanist" and "Montanist." To the former class belong "Concerning Baptism," "Concerning Penitence," "To Martyrs," "De Spectaculis," "Concerning Idolatry," "Concerning the Culture of Women," "Concerning Discourse," "Concerning Patience," and "To a Wife"; to the latter, "Concerning the Chaplet," "Concerning Fugitives Under Persecution," "Scorpiace," "An Exhortation on Chastity," "Concerning Monogamy," "Concerning Jejunius," "Against Fasting," and "Concerning Pallius"; while "Concerning Virgin's Veils" marks the transition stage.

Tertullian had a greater influence on the Latin Church than any theologian between Paul and Augustine. His Montanism indeed prevented it from being exercised directly, but Cyprian, who called Tertullian "his master," was the interpreter who gave currency to his views. The following is a summary of Harnack's estimate of Tertullian, whom he calls "the founder of Western Christianity." Tertullian's Christianity was molded by the enthusiastic and strict faith of the early Christians on the one hand, and by the anti-gnostic *regula fidei* on the other. A trained jurist, he sought to express all religion in legal formulas, and conceived the relation between God and man as one of civil law. "God appears always as the powerful partner, who watches jealously over his rights." Further, his theology shows a syllogistic-dialectic stamp; it does not philosophize, it reasons, using now the argument *ex auctoritate*, now the argument *e ratione*. He shows striking power of psy-

chological observation. Finally, his writings have a strong practical evangelic tendency; with their vivid appeal to the reader's will, and their simple concrete expression of the Gospel, they appealed not to theologians only, but to all. In these characteristics, and their union, Tertullian became the type of the Christianity of the Western Church.

Terutero, in ornithology, *Vanellus cayanensis*; the Cayenne sandpiper of Latham, described by Azara. It is very common in parts of South America. It approaches the European lapwing in its size, its tuft, and in the general tone of its colors; but it stands higher, and is armed with a spur at the folds of the wing. Its eggs, which are often deposited on the bare ground in October or November, are four or fewer, of a clear olive color marbled with black, and are esteemed a delicacy, like those of the plover in England.

Teschemacherite (after E. F. Teschemacher, who first announced it), a native carbonate of ammonia, occurring both in crystals and massive in guano deposits. Crystal system not ascertained; hardness, 1.5; sp. gr., 1.45; color, yellowish to white. Composition: Ammonia, 32.9; carbonic acid, 55.7; water, 11.4 = 100, yielding the formula $(\frac{1}{2}NH_4O + \frac{1}{2}HO)CO_2$.

Tesho Lama, the abbot of the great monastery at Krashis Lumpo; one of the great Lamas, the other being the Dalai Lama, who has the political supremacy. When either dies it is necessary for the other to ascertain in whose body the celestial being whose outward form has been dissolved has been pleased again to incarnate himself. For that purpose the names of all the male children born just after the death of the deceased Grand Lama are laid before his survivor, who chooses three out of the whole number. Their names are inscribed on tablets and put into a casket, whence one is selected by the abbots of the great monasteries to fill the place of the dead Lama. The Tesho Lama is often called Pantshen Rinpotshe (the Glorious Teacher).

Tesla, Nikola, an American electrical inventor; born in Smiljan, Austria-Hungary in 1857; studied engineering in the École Polytechnique, Paris; and in 1884 came to the United States, and for several years was employed at Edison's laboratory, near Orange, N. J. He then opened a laboratory of his own. In 1888 he completed his discovery of the rotating magnetic fluid by the invention of the rotary field-motor, the multi-phase system of which is used in the 50,000 horse-power plant built to transmit the water power of Niagara Falls to Buffalo and other cities. He invented many methods and appliances for the use of electricity, among them the production of efficient light from lamps without filaments, and the production and transmission of power and intelligence without wires. Among his wonderful inventions is that of the electrical oscillator, by which he claimed the electric current can be received from its source and given an intensity which will enable a copper wire to carry 50,000 horse-power across the ocean. In November, 1898, Tesla announced the discovery of, and on May 1, 1900, patented, a method of transmitting electrical energy without wires. Working along the same line Guglielmo Marconi invented his wireless-telegraphy. In 1901 Tesla discovered that the capacity of the electrical conductor is variable, thus opening up a new field for scientific research.

Tessellated Pavement, a pavement of rich mosaic work, made of squares of marbles, bricks, or tiles, in shape and disposition resembling dice, and known as tesseræ.

Tessera, a small cubical or other geometrical form of marble, earthenware, ivory, glass, etc., used for tesselated pavements, ornamenting walls, etc., colored tiles or bricks, usually cubical, laid in patterns, as a mosaic pavement. In antiquity, a small piece of wood, bone, or metal, used as a ticket of admission to the theaters in ancient Rome, or as a certificate given to gladiators, containing their names, that of the consul, and the day on which they had won their distinction in the circus.

Testacella, in zoölogy and palæontology, a genus of *Limacidæ*, with three recent species, from the S. of Europe, the Canary Isles, and Great Britain. Shell small and ear-shaped, placed at hinder extremity of the body which is elongated, broadest behind, tapering toward the head. The species are subterranean in habit, feeding on earthworms, and visiting the surface only at night. During the winter and in long periods of drought they form a sort of cocoon in the ground by the exudation of mucous; if this be broken away the animal may be seen in its thin, opaque, white mantle, which rapidly contracts till it extends but a little way beyond the margin of the shell. Fossil species two, from Tertiary strata.

Test Act, in English history, an act passed in 1563 by which an oath of allegiance to Queen Elizabeth, and of abjuration of the temporal authority of the Pope, was exacted of all holders of office, lay or spiritual, within the realm, except peers. Also, an act passed in 1678, by which it was enacted that all persons holding any important office, civil or military, under the crown or receiving money therefrom, should take the oaths of allegiance and supremacy, subscribe a declaration against transubstantiation, and receive the sacrament of the Lord's Supper according to the usage of the Established Church. It was repealed in 1828.

Testi, Fulvio, Count, an Italian poet; born in Ferrara, Italy, Aug. 23, 1593. He was one of the most notable lyric poets of

Italy in his time. Besides songs and ballads, he wrote: "Arsinda; or, the Line of the Princes d'Este," a drama; "The Isle of Alcina," a tragedy; an uncompleted epic, "Constantine"; "Italy," a poem in 43 stanzas in which he portrays the situation of Italy under the Spanish yoke. He died in Modena, Italy, Aug. 28, 1646.

Testing, the process of examining various substances by means of chemical reagents, with the view of discovering their composition. The term testing is usually confined to such examinations as seek to determine what chemical elements or groups of elements are contained in any substance, without inquiring as to the quantity of these elements. Testing is carried out either by the application of chemical reactions to solid substances, or by the application of reagents in solution to a solution of the substance under examination.

Testing Clause, in Scotch law, the clause in a formal written deed or instrument by which it is authenticated according to the form of law. It consists essentially of the name and designation of the writer, the number of pages of which the deed consists, the names and designations of the witnesses, the name and designation of the person who penned the deed, and the date and place of signing.

Testing Machines, machines used for the accurate testing of iron, steel and other materials used in constructive work. The problem which these machines are intended to solve is the adjustment with certainty a safe margin of strength with a minimum of weight, which can be determined only by experimental tests on full sized sections of the materials used in the construction. One method is to use machines designed to test small sample pieces under such conditions that the breaking strength of the test-piece is measured by the machine, and from the figures thus obtained is calculated the strength per square inch of the full-sized constructive material. A common feature of such machines is the common steelyard balance, supported by knife edges. There are several machines of this class, some of them built up to 100,000 pounds capacity and over. The hydraulic testing machine, invented by A. H. Emery, was originally used at the United States arsenal at Watertown, Mass. The greatest peculiarity of the Emery testing machine is the method by which the stress produced on the piece tested is conveyed to the scale and accurately weighed by mechanism that is entirely without friction, and hence responds to the same increment of load regardless of the amount of strain on the specimen. This result is accomplished by receiving the load against a flat closed cylinder called the hydraulic weighing head. One of the government experiments with this machine was the breaking by tension of a forged iron link 5 inches in diameter between the eyes, at a strain of 722,800 pounds, and immediately after a horse-hair $\frac{7}{1000}$ of an inch in diameter was slowly strained, and, after stretching 30 per cent., snapped under the recorded strain of 16 ounces.

Test Oath, an oath prescribed by the United States Congress July 2, 1862, to be taken by persons in the former Confederate States appointed to office under the National government. The text was as follows:

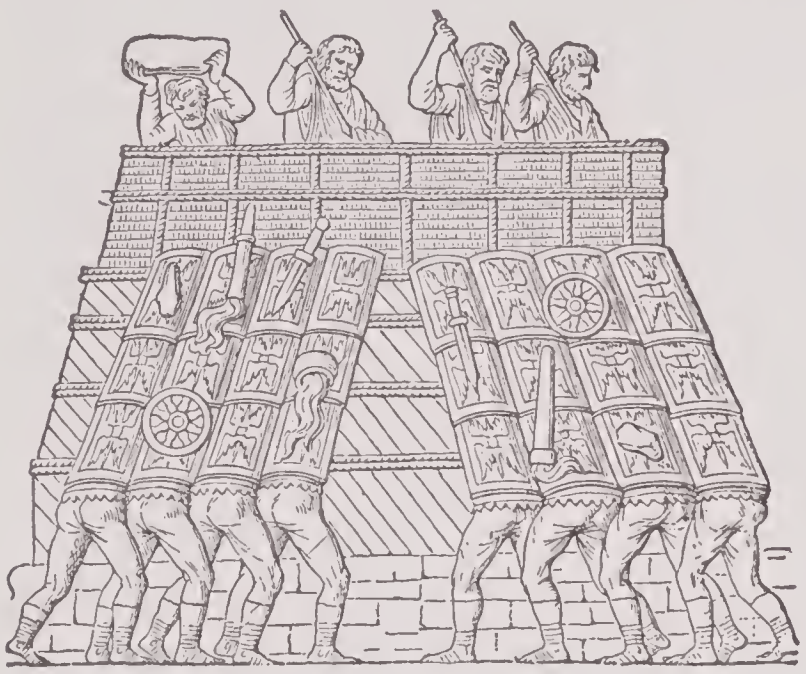
"I, A. B., do solemnly swear (or affirm) that I have never voluntarily borne arms against the United States since I have been a citizen thereof; that I have voluntarily given no aid, countenance, counsel, or encouragement to persons engaged in armed hostility thereto; that I have neither sought, nor accepted, nor attempted to exercise the functions of any office whatever, under any authority or pretended authority in hostility to the United States; that I have not yielded a voluntary support to any pretended government, authority, power, or constitution within the United States, hostile or inimical thereto. And I do further swear (or affirm) that, to the best of my knowledge and ability, I will support and defend the Constitution of the United States against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; that I take this obligation freely, without any mental reservation or purpose of evasion, and that I will well and faithfully discharge the duties of the office on which I am about to enter, so help me God."

Test Papers, in chemistry, are made by dipping unsized paper into an alcoholic solution of a vegetable coloring matter which changes color when exposed to the action of an acid or alkaline solution. The paper, after being gently dried, is cut into slips of a suitable size. Hence, by dipping the appropriate test papers into any solution, one can ascertain whether it is acid, alkaline, or neutral. Litmus and turmeric are most commonly used as the coloring matters; litmus for the detection of acids, and turmeric for that of alkalies. Test papers are also employed for detecting sulphuretted hydrogen, etc., and for such a purpose the paper must be dipped in the solution of an appropriate substance. Thus acetate of lead paper becomes black in presence of sulphuretted hydrogen, while starch paper becomes blue when touched with iodine.

Testudinaria (so named from the resemblance which the great, rugged, cracked root of the plant bears to the shell of a tortoise), in botany, the elephant's foot or Hottentot's bread; a genus of *Dioscoreaceæ,* akin to *Dioscorea,* but with the seeds winged only at the tip, instead of all round. Rootstock above ground sometimes four feet in diameter. Stems occasionally 40 feet long; flowers small, greenish-yellow. *T. elephantipes* is the common elephant's foot or Hottentot's bread. The rootstock is a large, fleshy mass, covered with a thick bark, cracked deeply in every direction. The Hottentots in time of scarcity made use of the fleshy inside of the root as a kind of yam.

Testudinidæ, the land tortoises; a family of *Chelonia,* very widely distributed in both hemispheres, but absent from Australia. The carapace is very convex; claws blunt; feet club-shaped, adapted for progression on land only; neck retractile. They are vegetable feeders, and the greater part of the species belong to the type genus *Testudo.* In some classifications the family includes the fresh-water tortoises, now generally made a separate family of *Emydidæ.* The family appears in the Miocene of Europe and the Eocene of North America.

Testudo, in Roman antiquity, a cover or screen used in assaults on fortified towns. In cases where the town was of small size



ROMAN TESTUDO.

and accessible on every side, while the force at the disposal of the besiegers was large, a ring of soldiers was drawn round the walls, a portion of whom kept up a constant discharge of missiles on those who manned the battlements, while the rest, advancing on every side simultaneously, with their shields joined above their heads so as to form a continuous covering like the shell of a tortoise (*testudine facta*), planted scaling ladders against a number of different points, and, at the same time, endeavored to burst open the gates. Also applied to a movable structure, on wheels or rollers, used to protect sappers.

In mining, a shelter similar in shape and design employed as a defense for miners, etc., when working in ground or rock which is liable to cave in.

In medicine, an encysted tumor, from a supposed resemblance to the shell of a tortoise.

In music, a name applied to a species of lyre, because, according to the legend recounted at full length in the Homeric hymn, the frame of the first lyre was formed by Hermes out of the shell of a tortoise.

In zoölogy, the tortoise; the type genus of *Testudinidæ,* with 25 species. Most abundant in the Ethiopian region, but also extending over the Oriental region, into the S. of Europe and the Eastern States of North America. Thorax convex, rather globular, and solid; breast-bone solid, with 12 shields, those of the throat separated; five toes on fore feet, four on the hinder pair.

Tetanus, stiffness or spasm of the neck; a disease common to mankind and animals. It is characterized by the contraction of a greater or less number of muscles by paroxysmal spasms, which aggravate the contractions and by troubles more or less accentuated in the calorification of the circulation and respiration. It is most commonly located in the jaw and begins with painful stiffness at the maxillary muscles and the muscles at the nape of the neck or by difficulty in swallowing. The progress of tetanus is either acute or chronic. The acute form develops in from one to four days; the chronic form may last a fortnight. In acute tetanus the average number of deaths ranges from 65 to 80 per cent. Till 1884 tetanus was regarded as a nervous accident connected with wounds, reflex neurosis, due to excitement of the nerves. Since that time it has been proved by many experiments that the disease is caused by a bacillus which secretes a very active poison, and that earth from the street or garden and especially from stables or manured land is swarming with these bacilli. It is the contact of the earth with any kind of wound, especially wounds in the hands or feet, which is the most important factor in the development of tetanus. No certain remedy for tetanus has as yet been discovered though antitetanic serum has been successfully used as a preventive. An extensive treatment by chloral and morphine, with disinfection of the wound by means of a powerful antiseptic solution of nitrate of silver at one per cent, and with surgical treatment — namely the cutting away of the center of infection, is recommended as an accompaniment to the antitetanus serum. A very simple preventive of lockjaw is here given. As soon as possible after the wound is received hold the part affected for 20 minutes in the smoke of woolen or flannel. This is easily procured by placing buts of woolen cloth on a shovelful of hot coals.

Tétard, Jean (tuh-tä′) a French philosophical and polemical writer; born in Longvic, Burgundy, in 1770. Among his writings are: "Moral Essay on Man in His Relation to God" (1818); "Against Obscurantism and Jesuitism" (1826); "In-

delible and Historic Character of Jesuitism and Doctrinism" (1832). He died in Paris in 1841.

Tete=du=pont, in fortification, a redan or lunette resting its flanks on the bank of a river and inclosing the end of a bridge for the purpose of protecting it from an assault.

Tethys, in Greek mythology, the greatest of the sea deities, wife of Oceanus, daughter of Uranus and Terra, and mother of the chief rivers of the universe, Nile, Peneus, Simois, Scamander, etc., and about 3,000 daughters called Oceanides. The name Tethys is said to signify nurse. In astronomy, a Satellite of Saturn. Its mean distance from the center of Saturn is 188,000 miles; its periodic time, 1 day, 21 hours, 18 minutes, 25.7 seconds. In zoölogy a genus of *Tritoniadæ,* with one species, from the Mediterranean, animal elliptical, depressed; head covered by a broadly expanded fringed disk with two conical tentacles; stomach simple. It attains a foot in length, and feeds on other mollusks and on small crustacea.

Tetrabranchiata, in zoölogy, an order of *Cephalopoda,* comprising three families; *Nautildæ, Orthoceratidæ,* and *Ammonitidæ,* though in some recent classifications the second family is merged in the first. Animal creeping, protected by an external shell; head retractile within the mantle; eyes pedunculated; mandibles calcareous; arms very numerous; body attached to shell by adductor muscles and by a continuous horny girdle; branchiæ four; funnel formed by the union of two lobes which do not constitute a distinct tube. Shell external, in the form of an extremely elongated cone, either straight or variously folded or coiled, many-chambered, siphuncled; the inner layers and septa nacreous, the outer layers porcellanous.

In palæontology, they attained their maximum in the Palæozoic period, decreasing from that time onward, and being represented at the present by the single genus *Nautilus.* The *Nautilidæ* proper and *Orthoceratidæ* are preëminently Palæozoic, while the *Ammonitidæ* are almost exclusively Mesozoic.

Tetracera, in botany, a genus of *Delimeæ,* owing its scientific name to the fact that its four capsules are recurved like horns. Shrubs or small trees, often climbing, with alternate, stalked, feather-nerved, naked leaves, often rough above, and panicled or racemose inflorescence. A decoction of *T. brcyniana* and *T. oblongata* is given in Brazil in swelling of the legs. *T. tigarca* is diaphoretic, diuretic, and antisyphilitic.

Tetrachordon, in music, an instrument similar in appearance to a cottage piano-forte, and like it played by finger-board, but the tone, instead of being produced by striking, is obtained by means of a cylinder of india-rubber charged with resin, kept in motion by a pedal, variety of tone being gained by the depth of pressure on the keys by the fingers. It is called the tetrachordon from an idea that its sounds are similar to those produced by a string quartet. The instrument is constructed also with self-acting machinery. Milton used the word as the title of one of his treatises on marriage, occasioned by his disagreement with his wife, Mary Powell. He explained the word in the sub-title: "Expositions upon the Four Chief Places of Scripture which treat of Marriage."

Tetradymite, a rhombohedral mineral found sometimes in crystals, but more frequently granular, massive, or foliated, often with auriferous ores; hardness, 1.5 to 2; sp. gr., 7.2 to 7.9; luster, bright metallic; color, pale steel-gray; somewhat sectile, in thin laminæ, flexible; soils paper. Composition: Somewhat variable, but consists principally of bismuth and tellurium. Dana divides as follows: (*a*) Free from sulphur, with formula Bi_2Te_3; (*b*) Sulphurous, with formula, $Bi_2(\frac{2}{3}Te + \frac{1}{3}S)_3$, and (*c*) Seleniferous, Also the same as JOSEITE and WEHRLITE. (*q. v.*)

Tetragoniaceæ, a small order of plants, alliance Ficiodales. No petals, and several consolidated carpels. They are succulent, leaved, herbaceous plants, or small shrubs, chiefly natives of New Zealand.

Tetragonurus, in ichthyology, a genus of *Atherinidæ,* with a single species. Body sub-elongate, scales strongly keeled and striated; first dorsal of numerous feeble spines, and continuous with the second. It is a rare fish, more frequently met with in the Mediterranean than in the Atlantic. Nothing is known of its habits, but as, when young, it accompanies the Medusæ, it must be regarded as a pelagic form. At a later period of its existence, it probably descends to greater depths, coming to the surface only at night. It attains a length of about 18 inches.

Tetragraptus, in palæontology, a genus of *Graptolitidæ* from the Skiddaw and Quebec groups (Lower Silurian). The polypary consists of four simple mono-prionidian branches, springing from a central non-celluliferous connecting process, which bifurcates at each end. The celluliferous branches do not subdivide, and the base may be enveloped in a peculiar horny disk.

Tetragynia, an order of plants in Linnæus' artificial system. It consisted of plants having four pistils. The classes Tetrandria, Pentandria, Hexandria, Heptandria, Octandria, and Polyandria, have each an order *Tetragynia.*

Tetrahedrite, a name given to a group of minerals having considerable diversity in composition, but presenting the same general formula. Named from the prevailing tetrahedral habit of its crystals. Crystallization isometric, frequently twinned; hardness, 3–4.5; sp.gr., 4.5–5.11; luster, metallic; color and streak, steel-gray to iron-black; opaque; fracture, sub-conchoidal, uneven; brittle. Composition, essentially a sulphantimonite of copper, with the formula $4CuS + Sb_2S_3$; but in consequence of part of the copper being frequently replaced by iron, zinc, silver, mercury, and occasionally cobalt, and part of the antimony by arsenic or bismuth, the general formula is usually written as $4(Cu, Fe, Zn, Ag, Hg) + (Sb, As, Bi)_2S_3$. Dana divides tetrahedrites as follows: (1) An antimonial series. (2) An arsenio-antimonial series. (3) A bismuthic-arsenio-antimonial and an arsenical series, in which the antimony is enitrely replaced by arsenic. The varieties are: (1) Ordinary, containing very little or no silver. (2) Argentiferous = freibergite. (3) Mercuriferous = schwatzite, spaniolite, and hermesite. (4) Platiniferous. Fieldite, aphthonite and polytelite are sub-species. An abundant ore in many parts of the world, sometimes, where rich in silver, mined for that metal only.

Tetrahedron, or **Tetraedron,** in geometry, a polyhedron bounded by four triangles. If the middle points of the faces be properly joined, two and two, the lines joining them are the edges of a second tetrahedron. A regular tetrahedron is one in which the faces are equal and equilateral triangles. If the middle points of the faces be joined two and two, the lines joining them form the edges of a regular tetrahedron. All regular tetrahedrons are similar solids.

Tetralogy, in Greek drama, the name given to a collection of four dramatic compositions—a trilogy and a satyric piece—exhibited together on the Athenian stage for the prize given at the festival of Bacchus. The expression tetralogy is sometimes applied by modern authors to a series of four connected plays.

Tetramera, in zoölogy, in Latreille's classification, a section of the Coleoptera. They are distinguished by the atrophy of the fourth tarsal joint in all the feet, so that they have only four freely articulating joints. The atrophied joint is generally extremely minute, and concealed in the deep notch of the third joint, which, in the majority of the species, is bilobed and clothed beneath with a brush of minute hairs. The section includes more than a third of the whole order, and all the species are vegetable feeders.

Tetramethyl Ethylene, in chemistry, a crystalline mass obtained by heating to 100° one volume of ethylenic bromide with two volumes of methylic sulphide. It is soluble in hot water and alcohol, insoluble in ether, and is precipitated by ether from its alcoholic solution, in white prisms.

Tetramorph, in Christian art, the union of the four attributes of the evangelists in one figure, winged, standing on winged, fiery wheels, the wings being covered with eyes. It is the type of unparalleled velocity.

Tetranthera, in botany, a genus of *Lauraceæ.* Trees mostly from the East, with feather-veined leaves and umbels of generally diœcious flowers, surrounded by bracts. The fruit of *T. roxburghii* yields a fatty exudation. The fruit of *T. laurifolia,* a moderate-sized Indian and Javenese tree, yields an oil. The seeds of *T. monopetala,* also an Indian tree, furnish an oil used for ointment and for candles. The oil from the berries of *T. laurifolia* is used in rheumatism, the bark saturated in water or milk is applied to bruises. It is given internally in diarrhœa, dysentery, etc. The tree has a fine wood. The bark of *T. monopetala* is mildly astringent and has balsamic properties. It is used medicinally like the oil from the former species.

Tetrao, in ornithology, the type genus of *Tetraoninæ* with seven species, from the N. parts of Palæarctic and Nearctic regions; but in some localities where they were formerly abundant, they now exist in greatly reduced numbers, and in some places have become extinct. Bill strong, upper mandible curved, head slightly crested, feathers of the chin elongated and pointed, tarsi completely covered with hair-like feathers. It is from the Post-Pliocene of Italian caves.

Tetraogallus, the snow partridge; a genus of *Perdicinæ,* with four species ranging from the Caucasus and Himalayas to the Altai Mountains. Bill short, broad at the base, with tip curved; head plumed; tarsi naked, shorter than middle toe, in the males armed with strong spur; hallux raised, short; wings with second and third quills longest; tail broad, rounded.

Tetraonidæ, a family of *Gallinæ,* or game birds, with four sub-families, *Tetraoninæ, Perdicinæ, Odontophorinæ,* and *Pteroclinæ,* (often elevated to the rank of a family). The *Tetraonidæ* include the grouse, partridges, quails, and allied forms. Wallace considers that they are essentially denizens of the great N. continents, and that their entrance into South America, Australia, and South Africa is, comparatively speaking, recent. They have developed into forms equally suited to the tropical plains and the arctic regions, some of them being

among the few denizens of the extreme N. as well as of the highest alpine snows. He puts the genera at 29 and the species at 120.

Tetraoninæ, the typical sub-family of the *Tetraonidæ,* chiefly from the N. parts of the Palæaretic and Nearctic regions, with the following genera: *Tetrao, Bonasa, Centrocercus, Dendragopus, Canace, Falcipennis, Pediocætes, Cupidonia,* and *Lagopus.* They are rather large in size, heavy in body, with small heads, the nasal fossæ filled with feathers concealing the nostrils; neck moderately long, wings short, rounded, and concave beneath; stout legs and feet; toes with pectinations of scales along the edges, hind toe elevated above the plane of the rest; tarsi covered with feathers, in *Bonasa* partially, in *Lagopus,* to the claws.

Tetraonyx, in zoölogy, an Asiatic genus of *Emydæ;* having five toes, but one on each foot without a nail. Twenty-five marginal scales. Species, *T. lessonii* and *T. baska.*

Tetraophasis, in ornithology, the *Lophophorus obscurus;* often made a separate genus of the sub-family *Lophophorinæ,* connecting the *Phasianinæ* with *Tetraogallus,* and so with the *Perdicinæ.* This bird was discovered by Père David in Thibet, and described by him. General color brown, marked with darker shades; bare skin of face red, tarsi and feet horn-color. The sexes are alike in plumage; female destitute of spurs.

Tetraphyllidea, a group or division of *Cestoidea,* or flatworms, in which are included several genera, and these embrace tapeworms of various fishes. In this division of cestoid worms the head is provided with four lobes, suckers, or tentacles, or is otherwise furnished with sets or parts of organs distinguished by fours.

Tetrapla, an edition of the Bible in four versions. The name is especially used for Origen's four-column work, an edition of the Greek versions of Aquila, Symmachus, and Theodotion, together with the Septuagint.

Tetrapolitan Confession. See SACRAMENTARIANS.

Tetrarch ("governor of the fourth part," *i. e.,* of a country), a title originally designating what is signified by its etymology, the governor of one of four divisions of a kingdom or country; but in the usage of the later Roman empire given undistinguishingly to all minor rulers, especially in the East, possessing sovereign right within their territory, but dependent on the emperor, and in many cases removable at his pleasure. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke, iii: 1) and by that of king (Matt. xiv: 9).

Tetrastyle, in architecture, having or consisting of four columns; having a portico consisting of four columns, as the Temple of Fortuna Virilis at Rome; a portico, etc., consisting of four columns. A cavædium was called tetrastyle when the beams of the compluvium were supported by columns placed over against the four angles of a court.

Tetrodon, or **Tetraodon,** in ichthyology, the type genus of *Tetrodontina,* having the upper and lower jaws divided by a mesial suture, so as to separate the dentition into four distinct portions. More than 60 species are known, from tropical and subtropical seas. In some the dermal spines are extremely small, and may be absent altogether, and many of them are highly ornamented with spots or bands. A few live in large rivers; as, *T. psittacus,* from Brazil; *T. fahaka,* from the Nile and West African rivers, and *T. fluviatilis,* from brackish waters and rivers of the East Indies.

Tetrolic Acid, $C_4H_4O_2$; a monobasic acid prepared by heating chlor *alpha* crotonic acid with alcoholic potassic hydrate on the water-bath, decomposing the potassium salt formed with sulphuric acid, and extracting with ether. It crystallizes in rhombic tables, soluble in alcohol and ether, melts at 76.5°, and boils at 203°.

Tettenborn, Friedrich Karl, Baron, a German soldier; born in the principality of Sponheim in 1794. In youth he joined the army of Austria, and in the wars of the French Revolution he became distinguished. In 1809 he gained great reputation for courage at the battle of Wagram. Later as lieutenant-colonel in the Russian army he served efficiently against Napoleon and several of his generals. He afterward fought under Bernadotte, and then in the army of Baden, becoming lieutenant-general. Subsequently he was made ambassador to Austria. He died at Vienna in 1845.

Tetuan, a seaport town of Morocco, Africa, in the province of El Garb; on the Mediterranean, immediately within the Straits of Gibraltar, 22 miles from Ceuta. The environs are carefully planted with vineyards and gardens; the grapes are exquisite, and the oranges reckoned, by some, superior to any in the world. In 1861 the Spanish government, having determined to abandon its claims against Morocco, declared Tetuan the property of Spain, rendered it impregnable, and colonized its territory. The imports here in 1896 were valued at $166,580; exports $24,810. Pop. estimated at 20,000-25,000.

Tetzel, Johann, a German preacher; entered the order of the Dominicans, and in 1502 was appointed by the Roman see a preacher of indulgences, and carried on for 15 years a very lucrative trade in them. His life was so corrupt that at Innsbruck he was sentenced to be drowned for adultery, but got off through powerful intercession. Having traveled to Rome, he was absolved

by Pope Leo X., and now carried on the sale of indulgences with still greater effrontery. Luther came out with his theses against this crying abuse in 1517, and the popular indignation aroused, brought on the REFORMATION. (*q. v.*). A great part of the money acquired by his traffic in indulgences was used for the erection of St. Peter's church at Rome. Tetzel died in Leipsic July 14, 1519.

Teucrium, a genus of plants, order *Lamiaceæ*, consisting of herbs and shrubs widely dispersed throughout the world, but abounding chiefly in the northern temperate and subtropical regions of the Eastern Hemisphere. They are called germanders. Several species were formerly reputed to possess medicinal virtues but are now discarded. The genus is represented in North America by *T. Canadense*, the wild germander, about two feet high, found in fields and roadsides throughout the United States.

Teudopsis, in palæontology, a genus of *Teuthidæ*, or a sub-genus of *Loligo* with five species, from the Upper Lias and Oölite of France and Würtemberg. Pen like the *Loligo*, but dilated and spatulate behind.

Teuffel, Wilhelm, a German philologist; born in Ludwigsburg, Germany, Sept. 27, 1820. His greatest work is the "History of Roman Literature" (1870). He wrote also: "Exercises in Latin Style" (1887); "Studies in Greek and Roman, and also in German Literary History" (1871); and edited with notes several Greek and Roman classics. He died in Tübingen, where he was professor in the university, March 8, 1878.

Teutates, in mythology, a deity mentioned by Lucan as being worshiped with sacrifices not unlike those of Moloch.

Teuthidæ, in zoölogy, calamaries, or squids; a family of dibranchiate Cephalopods, section Octopoda. Body elongated: fins short, broad, and mostly terminal; shell horny, consisting of a shaft and two lateral expansions or wings. There are 18 genera, very widely distributed, which D'Orbigny divided into two sub-families: *Myopsidæ* (having the eyes covered with skin) and *Oigopsidæ* (having the eyes naked, fins terminal and united, forming a rhomb).

Teuthididæ, in ichthyology, a family of *Acanthopterygii Perciformes*, with a single genus. Body oblong, strongly compressed, covered with small scales; lateral line continuous; one dorsal, the spinous portion being the more developed; anal with seven spines; ventrals thoracic, with an outer and an inner spine, with three soft rays between.

Teuthis, the sole genus of the family *Teuthididæ*, with about 30 species from the Indo-Pacific. They are small herbivorous fishes rather more than a foot long.

Teutoburg Forest, or **Teutoburger Wald,** a hilly district of Germany, in Westphalia, where Arminius defeated the Roman general Varus, 9 A. D. See ARMINIUS.

Teutones, or **Teutons,** in antiquity, a powerful German tribe, which, in alliance with the Cimbri, advanced into Illyria, and defeated the consul Cn. Papirius Carbo, at Noreia 113, B. C. They afterward forced their way into Roman Gaul, and defeated Manlius and Scipio 105 B. C.; and they invaded Spain 104 B. C. On their retreat from Spain, they were met by the Romans, under Marius, at Aquæ Sextiæ, the modern Aix, and totally defeated, 102, B. C.

Teutonic Cross, in heraldry, a name sometimes given to a cross potent, from its having been the original badge assigned by the Emperor Henry VI, to the TEUTONIC KNIGHTS (*q. v.*).

TEUTONIC CROSS.

Teutonic Knights, one of the three military-religious orders of knighthood founded during the period of the Crusades. Certain merchants of Bremen and Lübeck, witnessing the sufferings of the wounded Christians before Acre in 1190, were so moved with compassion that they erected tent hospitals for them, and provided for surgical and nursing attendance. There had been a German hospital in Jerusalem from 1128 to 1187; and the new arrangement at Acre was in some sort a continuance of this, being called the Hospital St. Mary of the Germans in Jerusalem. The new hospital, the attendants and founders of which formed themselves into a monastic order with the same rules as the Knights Hospitallers of St. John, found a patron in Duke Frederick of Swabia, and through him secured the countenance of his brother, the Emperor Henry VI., and the confirmation of the Pope (1191). Seven years later it was converted into a knightly or military order; and the change was stamped with the papal approval in 1199. The knights, in addition to the usual monastic vows, bound themselves to tend the sick and wounded, and wage incessant war on the heathen. Their distinguishing habiliment was a white mantle with a black cross. The chief officer of the order was the grand-master or "high-master," who was assisted by five other dignitaries. The chapter consisted of these six officers in conjunction with the provincial masters. The minor districts and individual castles were governed by commanders, who constituted also the respective provincial councils. There was, moreover, a class of "serving brothers," who performed menial

offices about the hospitals; and to these were added in certain places a class of inferior female domestics called "half-sisters."

About the year 1225 the Duke of Masovia (in Poland) invited the Teutonic Knights to help him against the heathen Prussians. The grand-master, Hermann von Salza, sent a body of knights, who experienced little difficulty in establishing themselves in the territories of the heathen. Twelve years later they were strengthened by the absorption into their order of the Brethren of the Sword, a military order which had been formed to convert to Christianity with the sword the Livonians, Esthonians, and Courlanders. At length the successive encroachments of the knights roused the Prussians to bitter opposition. A fierce warfare was then carried on for nearly a quarter of a century; but by 1283 the knights were masters of the territory lying between the Vistula and the Memel, and as heirs of the extinct Brethren of the Sword they had also extensive possessions in Livonia and Courland. In 1309 the executive officers of the order established themselves in the great castle of Marienburg, near the Vistula. After subduing the Prussians, the order entered on a hundred years' contest against the Lithuanians. But a most serious blow was struck at the knights by the conversion of the Lithuanians to Christianity and the accession (1386) of their prince to the throne of Poland.

From this time, having lost their main *raison d'être* — fighting against the heathen — the order began to decline. During the period of its prosperity, however, it had acted as the principal force in the politics of the Baltic countries; and both by its own exertions and by the encouragement it gave to the Hanseatic traders it was the means of spreading German civilization and manners throughout what are now the Baltic provinces of Russia. The order suffered an incalculable loss of prestige through the terrible defeat inflicted on them by the Poles and Lithuanians at Tannenberg in 1410. A desperate attempt to recover their power resulted (1466) in the loss of West Prussia and the alienation of the esteem and affection of their subjects in East Prussia, which they could only retain as a fief of Poland. In 1525 the order was secularized; its grand-master, Albert of Brandenburg-Anspach, being created hereditary Duke of Prussia under the suzerainty of Poland. The headquarters of the order — for it still possessed several estates scattered throughout the German empire and in one or two other countries — was fixed at Mergentheim in Swabia, and its possessions were reorganized in 12 bailiwicks. Thus it existed till 1801, when the estate W. of the Rhine were annexed by France; in 1809 the order was entirely suppressed by Napoleon in all the German States. This left only a couple of bailiwicks in Austria and one at Utrecht; and these still exist, severely aristocratic in both countries. The Austrian branch, reorganized in 1840, justifies its existence by maintaining an organization for the care of the wounded in war.

Teutonic Peoples, a term now applied: (1) to the High Germans, including the German inhabitants of Upper and Middle Germany and those of Switzerland and Austria. (2) The Low Germans, including the Frisians, the Plattdeutsch, the Dutch, the Flemings, and the English descended from the Saxons, Angles, etc., who settled in Britain. (3) The Scandinavians, including the Norwegians, Swedes, Danes and Icelanders.

Teutsch, Georg Daniel, a Transylvanian historian; born in Schässburg, Transylvania. He was bishop of the Saxons of Transylvania, and wrote: "History of the Transylvanian Saxons" (2d ed. 1874); "Compend of the History of Transylvania"; "Documents for the History of Transylvania" (1857); "The Reformation in the Transylvanian Saxonland" (6th ed. 1886); "Documentary History of the Evangelical Church in Transylvania" (2 vols. 1862–1863). He died in Hermannstadt, Transylvania, July 2, 1893.

Teverone. See Anio.

Tewfik Pasha, Khedive of Egypt; born Nov. 15, 1852; eldest son of Ismail Pasha; succeeded on his father's abdication in 1879, in virtue of the arrangement of 1866 between Ismail and the Sultan. The chief events of his reign were the insurrection of Arabi, the war with the Mahdi, the pacification of the Sudan frontiers, and the steady improvement of the condition of Egypt under English administration. Tewfik, a pious Moslem, utterly alien to his father's love of luxury and extravagance, was throughout loyal to his engagements with Great Britain. He died Jan. 7, 1892, and was succeeded by his eldest son Abbas.

Tewkesbury, an old market town of Gloucestershire, England; on the Avon at its confluence with the Severn; 9 miles N. N. W. of Cheltenham, and 15 S. by E. of Worcester. On the site of the cell of the hermit Theoc, from whom the place got its name, was founded in 715 a monastery, refounded in 1102 by Robert Fitzhamon as a great Benedictine abbey. Its noble church, consecrated in November, 1123, measures 317 feet by 124 feet across the transepts, and remains essentially Norman, in spite of later additions — Early English, Decorated, and Perpendicular. It was restored by Scott in 1875–1879. Special features are the W. front and the massive central tower, 132

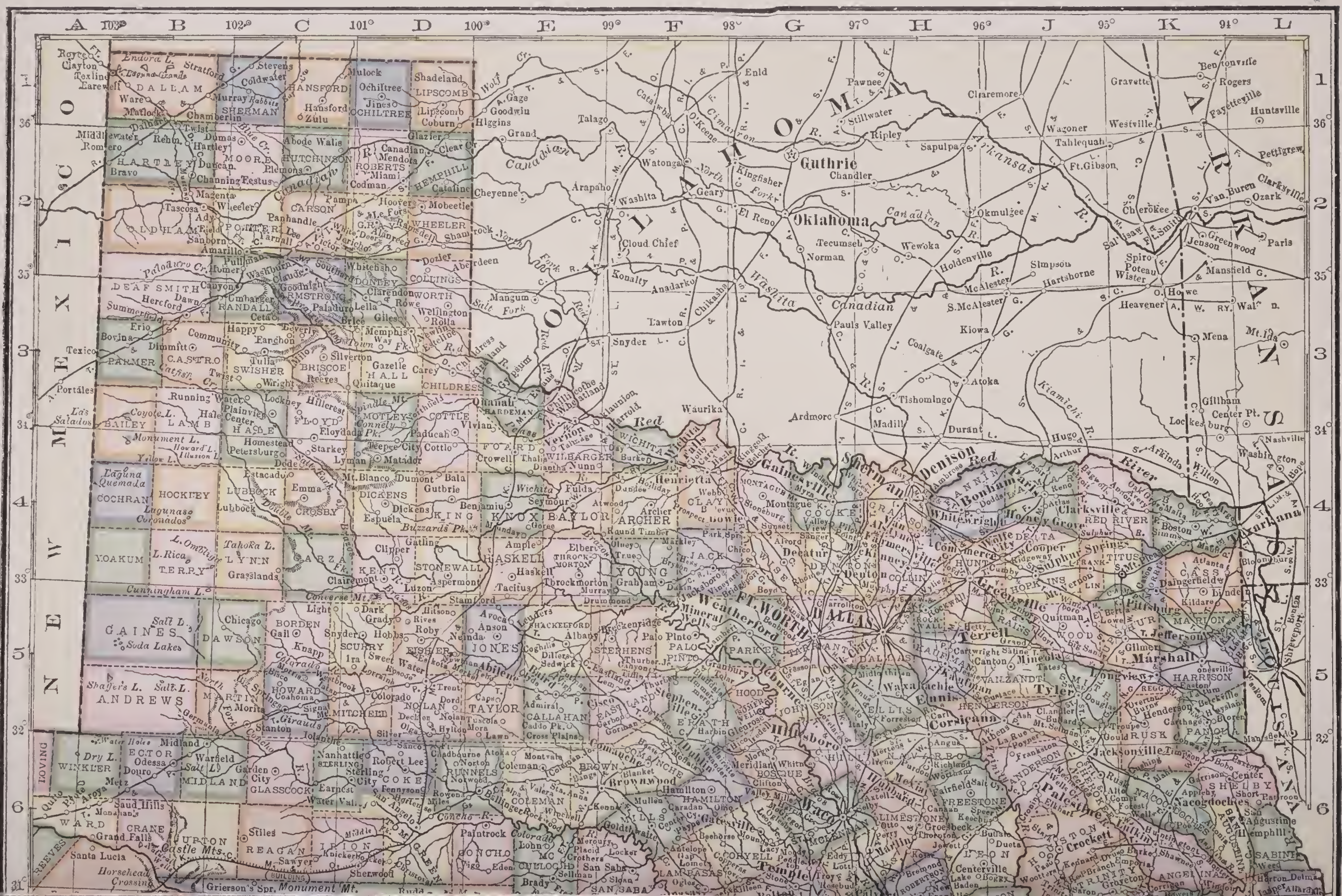
feet high. Many of the Clares, Despencers, Beauchamps, and other lords of Tewkesbury are buried here, as also the murdered Prince Edward and (possibly) Clarence; and in 1890 a tablet was erected to Mrs. Craik, the scene of whose "John Halifax" is laid in Tewkesbury. The place has also a town hall (1788), a corn exchange (1856), Telford's iron bridge over the Severn (1824) with a span of 176 feet, a free grammar school, etc. The thick mustard Falstaff speaks of is a thing of the past, and the trade is chiefly agricultural. Within half a mile was fought (May 4, 1471) the famous battles of Tewkesbury, in which the Yorkists under Edward IV. gained a crowning victory over the Lancastrians. The town was incorporated by Elizabeth in 1574.

Texarkana, a city partly in Miller co., Ark., and partly in Bowie co., Tex.; on the Texas and Pacific, the Arkansas and Choctaw, the Texarkana and Shreveport, the St. Louis Southwestern, Texarkana, and Fort Smith, and the St. Louis, Iron Mountain, and Southern railroads; 145 miles S. W. of Little Rock. Though a unit each part of the city has a separate municipal government, the part in Arkansas being the county-seat of Miller county. It contains street railroad and electric light plants, numerous churches, business colleges, United States government building, a National and other banks, and several daily and weekly newspapers. It has machine and boiler works, a cotton compress, a cottonseed oil mill, ice factories, car shops, etc., and an assessed property valuation of about $2,500,000. Pop. of part in Miller co., Ark., (1900) 4,914; (1910) 5,655; in Bowie co., Tex. (1900), 5,256; (1910) 9,790; total (1900) 10,170; (1910) 15,445.

Texas, a State of the United States, situated in the S. of the central division, between parallels 26° 51′ and 36° 30′ N. and meridians 93° 27′ and 106° 43′ W. It extends 737 miles N. and S. and 764 E. and W., and includes more than one-twelfth of the entire area of the United States, exclusive of Alaska and the island possessions. Its area is 265,780 square miles, including 3,490 square miles of water surface, chiefly coastal inlets. Texas is bounded on the N. by Oklahoma and Indian Territory; on the E. by Arkansas and Louisiana; on the S. by the Gulf of Mexico; on the S. W. by Mexico, from which it is separated by the Rio Grande; and on the W. by New Mexico. Its coast line is about 400 miles long. It is subdivided into 245 counties. Austin is the capital. The population in 1910 was 3,896,542.

Topography.—The surface of Texas may be divided into four sections. (1) W. of the Pecos river it is mountainous. The mountains lie in almost parallel lines N. W. and S. E. The eastern line includes the Guadalupe, Davis, Santiago, and Chisos mountains. The Guadalupe peak, 9,500 feet high, and Emory, 9,000 feet, are the highest points in this range. The western range lies very near the Rio Grande, and includes the Hueco, Quitman, and Vieja mountains. (2) E. of the Pecos, from the Rio Grande northward, is the southern end of the "Great Plains" of the United States. The southern part of this elevated region is known as the Edwards plateau. The remaining portion of it lying in Texas is known as the Llano Estacado or Staked plains. The altitude of this section ranges from 2,500 to 4,000 feet. (3) E. of this plateau is a triangular section, with its base extending along the Red river to the vicinity of Gainesville and its apex near Austin, known as the Central Province of Texas. Its western portion consists chiefly of elevated prairie regions, covered in many places with mesquite, and interspersed with areas of scrubby oak known as "shinnery." Its eastern portion is hilly, and the soil chiefly sandy, much of it covered with forests of blackjack and post oak, interspersed with stretches of prairie dotted here and there with clumps of live oaks and mesquite. The Central Province is crossed E. and W. by the "Callahan Divide," a chain of flat top buttes, between the valleys of the upper Brazos and Colorado. (4) The coastal plain includes all of the country E. and S. of an irregular line drawn from the Red river near Gainesville through Austin and San Antonio to Del Rio, on the Rio Grande. It consists of the Western Cross Timbers, Grand Prairie, Eastern Cross Timbers, Black Prairie, East Texas Timber Belt, Coast Prairie, and Rio Grande Plain—subdivisions covering many thousands of square miles each, some of them as large as an average-sized State. From an altitude of 1,000 feet in some parts of Grand Prairie, the coastal plain has a gradual slope to the Gulf shore. The Sabine, Trinity, Brazos, and Colorado are the principal rivers of this region. They flow in a southeasterly direction to the Gulf. The Rio Grande forms the southwestern boundary of Texas from the 32nd parallel to the Gulf. The Pecos crosses the western corner of the State for more than 200 miles. The Canadian and the Red cross the Panhandle, and the Red then becomes the boundary line to the N. E.

Climate.—On account of its size and relief Texas has a very varied climate. The rainfall decreases from E. to W. Along the eastern border it is 50 to 60 inches. Then comes a wide belt extending beyond Fort Worth and San Antonio, in which the rainfall ranges from 50 down to 33 inches. This decrease continues with great regularity, until an average of about 10 inches is reached at El Paso. The months of greatest rainfall are May and September, although May is a dry month in the Trans-


A 103° B 102° C 101° D 100° E 99° F 98° G 97° H 96° J 95° K 94° L
1 36 35 3 31 4 33 5 32 6 31
NEW MEXICO
OKLAHOMA
TEXAS
ARKANSAS
LOUISIANA
Guthrie
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Enid
Stillwater
Ripley
Pawnee
Claremont
Sapulpa
Tahlequah
Wagoner
Westville
Gravette
Bentonville
Rogers
Fayetteville
Huntsville
Pettigrew
Ft. Gibson
Chandler
Kingfisher
Watonga
Talago
Arapaho
Washita
Geary
El Reno
Cloud Chief
Okmulgee
Tecumseh
Norman
Wewoka
Holdenville
Konalty
Anadarko
Lawton
Pauls Valley
McAlester
S. McAlester
Hartshorne
Simpson
Spiro
Poteau
Wister
Heavener
Howe
Mansfield
Paris
Greenwood
Jenson
Cherokee
Van Buren
Fort Smith
Ozark
Clarksville
Mena
Mt. Ida
Atoka
Tishomingo
Ardmore
Madill
Durant
Hugo
Gillham
Center Pt.
Lockesburg
Nashville
Washington
Texhoma
Guymon
Hooker
Mocbeetie
Goodwin
Higgins
Coburn
Lipscomb
Shadeland
Ochiltree
Mulock
Stevens
Coldwater
Stratford
Royce
Clayton
Texline
Farewell
Endora L.
Laguna Grande
Ware
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Murray
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Zulu
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Rehm
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Duncan
Dumas
Abode Walls
Bravo
Channing
Festus
Plemons
Magenta
Tascosa
Wheeler
Ady
Field
Sanborn
Amarillo
Pullman
Homer
Canyon
Hereford
Dawn
Summerfield
Erio
Bovina
Texico
Dimmitt
Farwell
Portales
Las Salados
Running Water
Lockney
Plainview
Hale Center
Floydada
Petersburg
Homestead
Dodd
Estacado
Lubbock
Emma
Crosby
Dickens
Espuela
Gutbrie
Benjamin
Seymour
Atwood
Archer
Raund Timber
Olney
Markley
Ample
Elbert
Throckmorton
Haskell
Tacitus
Graham
Drummond
Stamford
Aspermont
Clairemont
Luzon
Gatling
Clipper
Grasslands
Lynn
Terry
Yoakum
Cochran
Hockley
Lubbock
Estacado
Mt. Blanco
Dumont
Bala
Paducah
Matador
Cottle
Crowell
Thalia
Dianthe
Nunn
Vivian
Quanah
Chillicothe
Vernon
Wichita Falls
Waurika
Henrietta
Gainesville
Montague
Stoneburg
Sunset
Valley View
Sanger
Alvord
Decatur
Bridgeport
Boyd
Jacksboro
Denton
Lewisville
Commerce
Greenville
Sulphur Springs
Cooper
Honey Grove
Bonham
Denison
Whitewright
Dodd
Atlas
Reno
Detroit
Clarksville
Red River
Boston
Simms
Daingerfield
Atlanta
Linden
Kildare
Pittsburg
Quitman
Mineola
Tyler
Jefferson
Marshall
Gilmer
Longview
Kilgore
Henderson
Carthage
Jacksonville
Timpson
Center
Nacogdoches
Lufkin
Crockett
Groveton
Trinity
Palestine
Corsicana
Waxahachie
Ennis
Cleburne
Hillsboro
Mexia
Fairfield
Teague
Wortham
Richland
Corbet
Meridian
Whitney
Clifton
Hamilton
Gatesville
Coleman
Brownwood
Comanche
Stephenville
Dublin
Granbury
Mineral Wells
Weatherford
Fort Worth
Dallas
Terrell
Canton
Grand Saline
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Mansfield
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Salt L.
Soda Lakes
Shafter's L.
Salt L.
Dry L.
Water Holes
Laguna Quemada
Lagunas Coronados
Monument L.
Howard L.
Illusion L.
Yellow L.
Tahoka L.
L. Omblight
L. Rica
Buzzards Pk.
Double Mt.
Catfish Cr.
Paladuro Cr.
Blue Cr.
Wolf Cr.
Red Deer Cr.
Clear Cr.
Sweetwater Cr.
Deer Cr.
Pease R.
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Red R.
Canadian R.
North Fork Canadian R.
Salt Fork Red R.
Prairie Dog Town Fk. Red R.
Elm Fk. Trinity R.
West Fk. Trinity R.
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Concho R.
Colorado R.
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Neches R.
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Kiamichi R.
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Sulphur R.
Cypress Cr.
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Big Sandy Cr.
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Brenham
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Prairie View
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Lake Jackson
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Sweeny
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Quintana
Jones Creek
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Riviera
Sarita
Raymondville
Harlingen
San Benito
Brownsville
Port Isabel
Los Fresnos
Rio Hondo
Arroyo City
Combes
Lyford
Willacy
Kenedy
Karnes City
Falls City
Pleasanton
Jourdanton
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Nixon
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Kyle
San Marcos
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Austin
Bastrop
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Round Rock
Georgetown
Granger
Thorndale
Rockdale
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Bartlett
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Kyle
San Marcos
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Austin
Bastrop
Elgin
Manor
Taylor
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Round Rock
Georgetown
Granger
Thorndale
Rockdale
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Milano
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Temple
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Lorena
Waco
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Lacy
Moody
Eddy
Lott
Troy
Temple
Belton
Killeen
Harker Heights
Nolanville
Copperas Cove
Gatesville
Evant
Hamilton
Hico
Stephenville

TEXAS

SCALE OF MILES

0 20 40 60 80 100

State Capital ⊛ County Seats ⊙

Hammond's 8 x 11 Map of Texas

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WESTERN PORTION OF TEXAS

Same Scale as Main Map

TERRELL · SUTTON · KIMBLE · MASON · GILLESPIE · KERR · KENDALL · BANDERA · MEDINA · UVALDE · REAGAN · IRION · TOM GREEN · CONCHO · MCCULLOCH · SAN SABA · LLANO · BURNET · WILLIAMSON · BELL · CORYELL · HAMILTON · MILLS · LAMPASSAS · COMANCHE · BOSQUE · HOOD · SOMERVELL · JOHNSON · TARRANT · DALLAS · ELLIS · NAVARRO · HILL · FALLS · MCLENNAN · LIMESTONE · FREESTONE · ANDERSON · CHEROKEE · HENDERSON · KAUFMAN · VAN ZANDT · SMITH · RUSK · PANOLA · GREGG · HARRISON · UPSHUR · WOOD · RAINS · HUNT · FANNIN · GRAYSON · COLLIN · DENTON · CLAY · MONTAGUE · COOKE · WISE · JACK · YOUNG · ARCHER · BAYLOR · WICHITA · CLAY · KNOX · FOARD · HARDEMAN · WILBARGER · RED RIVER · BOWIE · CASS · MARION · HARRISON · TITUS · MORRIS · CAMP · UPSHUR · FRANKLIN · HOPKINS · DELTA · LAMAR · RED RIVER

BREWSTER · PRESIDIO · JEFF DAVIS · REEVES · LOVING · WARD · CRANE · UPTON · REAGAN · CROCKETT · PECOS · TERRELL · VAL VERDE · EDWARDS · REAL · KINNEY · MAVERICK · ZAVALA · DIMMIT · LA SALLE · MCMULLEN · WEBB · ZAPATA · STARR · HIDALGO · WILLACY · CAMERON · KENEDY · BROOKS · JIM HOGG · DUVAL · JIM WELLS · NUECES · KLEBERG · KENEDY · WILLACY · CAMERON

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Rio Grande · Pecos R. · Devils R. · Nueces R. · Frio R. · Sabinal R. · Medina R. · Guadalupe R. · San Antonio R. · San Marcos R. · Colorado R. · Brazos R. · Navasota R. · Trinity R. · Neches R. · Sabine R. · Red R. · Canadian R. · Salt Fork · Wichita R. · Big Wichita R. · Little Wichita R. · Pease R. · Brazos R. · Double Mt. Fork · Clear Fork · Paint Creek · Cottonwood Creek · Elm Fork · Trinity R. · Denton Creek · Grapevine Creek · Mountain Creek · Cedar Creek · Kiamichi R. · Sulphur R. · Cypress Creek · Big Cypress Bayou · Little Cypress Bayou · Caddo Lake · Sabine Lake · Sabine Pass · Sabine L. · L.H. · Galveston Bay · Trinity Bay · East Bay · Matagorda Bay · Matagorda Pen. · Matagorda I. · Lavaca Bay · Lavaca R. · Pass Cavallo · Aransas Bay · Corpus Christi Bay · Corpus Christi Pass · Laguna Madre · Padre Island · Brazos Santiago L.H. · Boca Chica · Clarke I. · Port Arthur · Pt. Penascal · Salt Lagoon · Mesquite · Alice · Driscoll · Robstown · Banquete · Agua Dulce · Sweden · Realitos · Hebronville · Ojuelos · Ella · Spohn · Paisano · Sarita · Mifflin · Fulfurrias · Panchita · Turcotte · Katherine · Sanramon · Rudolph · Nerias · Yturria · Stillman · Combes · Arroyo · Harlingen · Brownsville · Rio Grande City · Ft Ringgold · Roma · Mier · Guerrero · Carrizo · Cuevitas · Zapata · San Ygnacio · Randado · Delfina · Raymondville · Lyford · McAllen · Hidalgo · Santa Maria · Bessie · Reynosa · Garcias · San Miguel · Havana · Ensenada · Escondido · Matamoras · La Loma · Isabel · Port Isabel · Laguna Madre · Padre Island · Brazos Santiago L.H. · Boca Chica · Clarke I.

A 106° B 105° C 104° D 103° E 102° F 101° G 100° H 99° J 98° K 97° L 96° M 95° N 94°

Long. West from Greenw.

7 8 9 10 11 12

29° 30° 31° 26° 27° 28°

Texas

Pecos region. The average mean annual temperature along the coast is about 70. Northward this average falls about one degree to every 40 miles, reaching an average below 56 in the northern portion of the Panhandle. South of the 32nd parallel the temperature rarely falls below 20, while in the extreme northern part of the State it goes 5 to 15 below zero. The summer heat is so tempered by cool breezes that serious results from becoming overheated are almost unknown.

Geology.—Excepting the Silurian and Devonian, the various geologic periods are all represented in the surface rocks of Texas. Their distribution is as follows: The Archæan rocks are found in the country tributary to the Colorado river, where it receives the Llano. This group of rocks furnishes the granite of which the State Capitol, the Galveston sea-wall, and the dam across the Colorado, at Austin, were built. The Ordovician and the Cambrian rocks surround the above group in the Llano country and also occur in one or two places near El Paso. Carboniferous rocks extend from the Llano country N. almost to Red river and also appear in the Trans-Pecos country. In this belt are found rich beds of bituminous coal. There are outcrops of Carboniferous rocks in several places in the Trans-Pecos country. Between the Staked plains and the Carboniferous region are found the Permian rocks. Skirting the eastern scarp of the Staked plains are very narrow bands of Jura-Trias rocks, being horizontal strata of a conglomerate of sandstone, coarse pebble, and clay. The Cretaceous belt reaches from the Red river to the Rio Grande, with its southern border extending, with slight curves, from just W. of Texarkana, in the N. E., to the Rio Grande, a short distance below Del Rio, and with its northern boundary extending in a very irregular line from the Red river in Montague co. to the Rio Grande, W. of Fort Davis. This belt constitutes one of the finest agricultural sections of the entire Southwest. The Eocene belt reaches entirely across the State just S. E. of the Cretaceous belt, extending about half way to the Gulf. The soils of this region are very much mixed, sands, different colored clays, sandstones, and limestones, thrown irregularly together. From the Eocene to the Gulf, extending across the State, the soils are of Neocene-Recent formation. They are marine in origin and composed of sand, clay, and silt. The Staked plains and part of the Trans-Pecos country are also of the Recent-Neocene period, but are not of marine origin, as is evidenced by the fossils found in the underlying strata, which are of land animals, such as the elephant, horse, and camel.

Mineralogy.—Coal, iron, and petroleum are the most valuable minerals. The output of coal in 1905 was 1,200,684 short tons, of which 809,151 tons was bituminous, and 391,533 tons was lignite. Iron occurs in three different sections of the State. In the N. E. iron deposits cover an area of about 1,000 square miles; valuable magnetic iron ore beds exist at Llano, and iron deposits are found in the Trans-Pecos country. Petroleum wells are widely distributed over the State. The Corsicana oil field, the oldest in the State, has been steadily worked for more than ten years. The Beaumont field, discovered in 1900, has shown itself to be one of the richest in the world. The total output of crude petroleum in 1905 was 28,162,258 barrels of 42 gallons each, to which the Humbe pool alone, opened on Dec. 31, 1904, contributed 15,594,310 barrels; Spindle Top (Beaumont), 1,652,780 barrels; Sour Lake, 3,362,153 barrels; Saratoga, 3,125,028 barrels; and Batson, 3,774,841 barrels. The value of the total production in 1905 was over $7,552,000. The total production of crude oil during the ten years 1896-1905 amounted to 92,929,087 barrels. In 1896 the total production was 1,450 barrels. Other minerals found in paying quantities in various localities are salt, silver, mercury, gypsum, granite and other building stones, cement rock, fine clays for pottery, tile, drainage pipe, and brick.

Agriculture.—The immense area of fertile land and the favorable climate make agriculture the chief industry in Texas. The State leads all other States in cotton production and the number of live stock. The sandy lands of the timbered portions of the State are especially adapted to fruit and vegetables, and in no portion of the State has greater improvement been made in agricultural conditions in the last decade than in the fruit and truck growing sections of the E. and S. Small grain thrives best on the prairie lands of the N. and N. W. Corn does well wherever there is sufficient moisture. Cotton grows all over the State. Sugar cane and rice thrive in the S. wherever there is sufficient moisture, natural or artificial. Sorghum grows all over the State as though it were indigenous. In all of the sandy lands sweet potatoes and melons do well. The crop reports of 1906 show for Texas the following yields: corn, 155,804,702 bushels, valued at $77,902,391; wheat, 14,126,186 bushels, value $10,877,163; oats, 31,822,512 bushels, value $13,047,230; potatoes, 2,349,469 bushels, value $2,083,188; rice, 8,428,536 bushels, value $7,585,682; hay, 683,705 tons, value $5,811,492. The sweet potato crop was fully as valuable as the Irish potato crop given above, and the sugar production was about 40,000,000 pounds, valued at $1,600,000. The cotton crop of 1906 yielded 4,066,472 bales, worth $203,323,600. Other important crops are barley, rye, onions, fruit, vegetables, and tobacco. The wool produced in 1906 was

Texas

9,360,000 pounds, worth $2,162,160. The live-stock reports for Jan. 1, 1907, give Texas 1,908,691 horses and mules, worth $138,219,872; 9,229,671 cattle, worth $125,436,314; 1,665,963 sheep, worth $4,453,119; 2,860,879 hogs, worth $16,020,922. In many places where the natural rainfall is insufficient, very fine crops are raised by irrigation. Frequently the water is taken from the rivers and creeks, but in large portions of the S. W. water for irrigation is gotten from deep wells.

The following tables illustrate the growth and development of the various phases of agriculture in Texas between 1880 and 1900.

TABLE I. NUMBER AND ACREAGE OF FARMS, ACREAGE OF IMPROVED AND UNIMPROVED LAND, AND AVERAGE SIZE OF FARMS

	1880	1890	1900
Number of farms	174,184	228,126	352,190
Total acreage of farms	36,292,219	51,406,937	125,807,017
Unimproved acreage	23,641,905	30,660,722	106,230,941
Improved acreage	12,650,314	20,746,215	19,576,076
Per cent. of improved farm land	34.9	40.4	15.6
Average number of acres per farm	208.4	225.3	357.2

Of the total number of farms in 1900, 286,654 (81.4 per cent.) were operated by whites and 65,472 (18.6 per cent.) by negroes. The acreage of the negro farms was 3,835,979, or only 3.04 per cent. of the total farm acreage. The average acreage per farm for white farmers was 425.5; for negro farmers, 58.6. Divided according to principal source of income, 228,606 farms (64.9 per cent.) derived their main income from cotton; 42,624 farms (12.1 per cent.) from live stock; 26,132 (7.4 per cent.) from hay and grain; 4,668 (1.3 per cent.) from dairy produce; 4,258 (1.2 per cent.) from vegetables; 1,129 (0.3 per cent.) from fruit; 264 farms from sugar, 160 from tobacco, 125 from rice, 73 from nursery products, 66 from flowers and plants, and miscellaneous 44,085 (12.5 per cent.). Divided according to size of farms, 27,720 contained under 20 acres; 99,137 contained between 20 and under 50 acres; 88,537 contained between 50 and under 100 acres; 71,392 contained between 100 and under 175 acres; 44,001 contained between 175 and under 500 acres; and 21,403 contained 500 acres and over.

TABLE II. VALUE OF FARM PROPERTY

	1880	1890	1900
All farm property	$256,084,000*	$552,127,000*	$962,476,000
Farm land with improvements, including buildings	170,469,000	399,971,000	691,774,000
Implements and machinery	9,051,000	13,747,000	30,126,000
Live stock	76,564,000*	138,409,000*	240,577,000

* Including the value of range animals.

The value of farm property owned by negroes in 1900 was $56,180,207.

TABLE III. NUMBER AND PERCENTAGE OF FARMS OF SPECIFIED TENURE

	1880	1890	1900
Farms operated by owners (including part owners, owners and tenants, and managers)	108,716	132,616	177,199
Per cent. of total number of farms	62.4	58.1	50.3
By cash tenants	12,089	20,081	25,810
Per cent	6.9	8.8	7.3
By share tenants	53,379	75,429	149,181
Per cent	30.7	33.1	42.4

Of the farms operated by negroes, 30.7 per cent. were operated by owners, 0.1 per cent. by managers, and 69.2 per cent. by tenants, of which 12.9 per cent. were operated by cash tenants and 56.3 by share tenants.

Manufactures.—The Census of Manufactures of 1905 has shown a notable increase in the manufacturing industries of the State. Considering the number of wage-earners employed, the most important industries were: Lumber, timber, and planing mill products, with 14,385 wage-earners (exclusive of salaried officials and clerks) and $18,600,000 value of products; cars and general shop construction and repair by steam railroad companies, 8,593 wage-earners and $10,473,000 value of products; printing and publishing, including newspapers and periodicals, 3,434 wage-earners and $7,816,000 value of products; cottonseed oil and cake, 2,739 wage-earners and $18,699,000 value of products; wholesale slaughtering and meat packing, 2,019 wage-earners and $15,621,000 value of products; and foundry and machine shop products, with 1,988 wage-earners and $4,953,000 value of products. Other leading industries were: Brick and tile, men's clothing, confectionery, coppersmithing and sheet-iron working, cotton goods, flour and grist mill products, manufactured ice, malt liquors, petroleum refining, sugar and molasses refining, and saddlery and harness. Cooperage, mattresses and spring beds, furniture, mineral and soda waters, monuments and tombstones, patent medicines, tobacco, cigars, and cigarettes, are also important industries. The industrial

Texas

growth of Texas since 1880 is shown in the following:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Value of Products
1880	2,996	$9,246,000	12,159	$3,343,000	$20,720,000
1890	5,268	46,815,000	34,794	15,148,000	70,434,000
1900	12,289	90,434,000	48,153	20,552,000	119,415,000

The special United States Census of Manufactures of 1905 was confined to industries carried on under the factory system, to the exclusion of hand and neighborhood trades. Comparing the figures of 1905 with the corresponding figures of 1900, we obtain the following results:

	1900	1905	Per cent. Increase
Number of establishments	3,107	3,158	1.6
Capital	$63,656,000	$115,665,000	81.7
Salaried officials, clerks, etc	2,861	5,753	101.1
Salaries	$2,919,000	$6,118,000	109.6
Wage-earners	38,604	49,066	27.1
Wages	$16,912,000	$24,469,000	44.7
Cost of materials used	$54,388,000	$91,604,000	68.4
Value of products	$92,894,000	$150,528,000	62.0

The number of women employed in factories increased from 1,693 in 1900 to 2,479 in 1905, or 46.4 per cent., while the number of children under 16 years fell from 916 in 1900 to 821, a decrease of 10.4 per cent. As regards the local distribution of industries in 1905, there were 1,175 factories in the urban districts (that is, the 16 municipalities having in 1900 a population of at least 8,000) and 1,983 in the rural districts; $45,187,000 and $70,477,000 of invested capital respectively; 19,752 and 29,304 wage-earners respectively; and $63,341,000 and $87,187,000 value of products respectively. The percentage of increase for the five-year period was larger for the rural districts than for the urban in every item except the number of establishments. The chief manufacturing cities in the State are Dallas, Houston, San Antonio, and Fort Worth.

In 1906 there were in operation in the State 160 cottonseed-oil mills, producing 58,759,320 gallons of oil, with a total value, including by-products, of $52,349,540. The combined capacity of the flour mills in 1906 was 24,000 barrels daily. The salt works of the State have an annual capacity of 6,000 carloads. Fort Worth and vicinity has become a great meat-packing center, a capital of $5,000,000 having been invested here in this industry within the last five years. Dallas is noted for its manufactures of harness and saddlery.

Commerce.—The commerce of Texas has more than doubled within the last ten years. The tonnage of freight hauled by the railroads of the State for the year ending June 30, 1896, was 14,510,919 tons, while for the year ending June 30, 1906, it was 34,998,754. The imports consist mainly of coal, manufactured articles of food, clothing, and machinery, and building material. The chief exports are cotton, cottonseed oil, fruits and vegetables, cattle, wool, hides, petroleum, and lumber. Galveston ships more cotton than any other port in the world, New Orleans following. In 1906 Galveston ranked next to New York in the total value of exports shipped from her wharves. From Port Arthur and Beaumont large quantities of lumber and oil are shipped to all parts of the world. From Corpus Christi are exported cattle, wool, and hides. The earnings of the express companies in the State for 1906 were $2,513,420.

Railroads and Post Offices.—Texas has the greatest railway mileage of any State in the Union. June 30, 1906, the total track mileage within the State was 14,651 miles—about 10 per cent. of the entire railway mileage of the United States. According to mileage of main and branch lines in the State, the following are the leading railroads: Southern Pacific, over 1,500 miles; the Missouri, Kansas, and Texas, the International and Great Northern, the Gulf, Colorado, and Santa Fé, the Texas and Pacific, each over 1,300 miles; the Houston and Texas Central, the San Antonio and Aransas Pass, the St. Louis Southwestern, each over 800 miles; the Texas and New Orleans, the Fort Worth and Denver, each over 500 miles; and the Rock Island, over 400 miles. On July 1, 1907, there were 3,153 post offices in Texas.

Banking.—Excepting Pennsylvania, there are more National banks in Texas than in any other State in the Union. On Oct. 31, 1906, there were in operation in the State 488 National banks, having $35,904,197 in capital, $21,272,981 in outstanding circulation, and $20,142,110 in U. S. bonds. The individual deposits in these banks, June 30, 1906, were $130,364,110. The exchanges of the United States clearing houses at Fort Worth, Galveston, and Houston for 1906 amounted to $926,958,453, nearly double the amount reported by these same houses for 1901. From the passage of the present State banking law, in 1905, to Dec. 20, 1906, there were organized 157 State banks and trust companies, with a combined capital of $5,616,500. In addition to these there were in the State private banks with a total capital of $3,119,527, thus making the total capital of all the banks in the State, Dec. 20, 1906, nearly $45,000,000.

Education and Periodicals.—There is a system of State schools and a large number

Texas

of private and denominational schools. The majority of the district schools rely almost wholly on the State appropriation and continue about five months in the year. The "independent districts," including many country schools and most of the village and city schools, usually supplement the State fund by local taxation and continue their schools seven to nine months. More than 200 of these districts have raised their courses of study, so as to include from two to four years of good high-school instruction. The available annual State fund consists of the income from the permanent fund, one-fourth of the occupation taxes, a poll tax of $1, and a State tax not to exceed 20 cents. The permanent fund, Sept. 1, 1906, amounted to $47,853,192.65, besides 6,000,000 acres of unleased lands. The statistics for the session 1904-05 show a school population (ages 8 to 17) of 798,675; enrollment in the schools, 756,019; average daily attendance, 501,734; expenditure, $6,400,492; number of buildings, 11,333; total value of public school property, $11,896,674; number of teachers, 17,110. The school census of 1906 shows (ages now 7 to 17) 869,864 children. The State supports three normal schools for whites, located at Huntsville, Denton, and San Marcos; one for colored teachers at Prairie View; a College of Industrial Arts for white girls at Denton; an agricultural and mechanical college at Bryan. Schools for the unfortunate are maintained in the Orphan's Home, at Corsicana, and in the asylums for the deaf and dumb, and the blind, at Austin. The University of Texas, at Austin, has its Medical Department at Galveston. The total enrollment for 1906-07 in all departments, including the summer term, was 2,273. There are about 70 private secondary schools and 20 denominational colleges and universities. The total attendance in these schools for 1906 was about 13,000, and the value of their properties about $6,000,000. The principal denominational colleges and universities are Baylor University and Texas Christian University, at Waco; Southwestern University, at Georgetown; Trinity University, at Waxahachie; Austin College, at Sherman; Fort Worth University and Polytechnic College, at Fort Worth; St. Edward's College, at Austin; Baylor Female College, at Belton; and Simmons College, at Abilene.

On Jan. 1, 1907, there were 912 periodicals, of which 93 were daily, 733 weekly, 25 semi-weekly, 53 monthly, 5 semi-monthly, and 3 quarterly. In 1905 there were published 797 newspapers and periodicals, of which 766 were in English, 24 in German, 3 in Spanish, 3 in Bohemian, and 1 in Scandinavian.

Churches.—The leading religious denominations in Texas are Baptists, Methodist Episcopal, South; Presbyterian, South; Presbyterian, Cumberland Presbyterian, Disciples of Christ, Methodist, German Methodist, African Methodist, Protestant Episcopal, Lutheran, Roman Catholic, and Jews. There are many scattered congregations of other denominations in the State. The religious denominations are in a flourishing condition, and most of them maintain excellent schools, both elementary and higher institutions of learning. They maintain district and State associations for coöperative charitable, educational, and missionary work. The handsome church and school buildings erected by these denominations, the large number of yearly additions to their numbers, and the immense sums of money contributed for the support of their various enterprises, all attest their healthful growth.

Finances.—On Aug. 31, 1906, the bonded debt of the State was $3,989,400, 85 per cent. of this amount being held by the permanent school fund, the University fund, and other special funds of State institutions, leaving a net public debt of only $603,800. The general revenue of the State for the year ending Aug. 31, 1906, was $4,203,695. Adding to this the amounfs received for the various special State funds, the total receipts by the State treasurer were $11,815,057. The disbursements for the year, including permanent investments for the various special funds, were $10,934,664, leaving a balance in the treasury, Aug. 31, 1906, of $1,333,649 in cash and $13,893,708 in bonds held for the various State funds. The assessed valuations for 1906 were: real estate, $863,046,919; personal property, $326,613,073; total property valuations, $1,189,659,992. There were also franchises valued at $31,499,877.

State Government.—The present State constitution was adopted in 1876. The executive State officials, elected biennially, are a governor (salary, $4,000 per annum), lieutenant governor, treasurer, comptroller, land commissioner, attorney general, State superintendent of public instruction, and 3 railroad commissioners, holding office for 6 years. The governor appoints a secretary of state, adjutant general, commissioners of agriculture, insurance, statistics, and history, an assistant attorney general, State revenue agent, State health officer, fish and oyster commissioner, tax commissioner, and State purchasing agent. The judiciary includes a supreme court for civil cases, a court of criminal appeals for criminal cases, and 6 courts of civil appeals, also district, county, commissioners', and justice courts. Each of the appellate courts consists of 3 judges elected for terms of 6 years. The legislature consists of 31 senators, elected for 4 years, and 133 representatives, elected biennially. Texas has 16 representatives in Congress. There are 4 United States district courts in Texas.

Voters must have resided one year in the State and six months in the district where the vote is cast. On financial measures only taxpayers are allowed to vote.

History.—The Spanish claim to Texas was based upon the discoveries and explorations of Pineda in 1520; Cabeza de Vaca, 1535; Coronado, 1540; Espejo, 1582; and others. But little progress was made toward actual occupancy until La Salle landed on the shores of Matagorda bay in 1685, built Fort St. Louis, and proclaimed French authority over the new country. Then began a contest for the possession of the territory W. of Louisiana, which continued until France ceded Louisiana to Spain in 1762. Fort St. Louis was destroyed by the Indians before the Spanish troops found it, but Spain at once determined to hold the country by actual occupancy. Under the authority of Spain, the Franciscan Fathers established a series of "missions," hoping to secure large numbers of converts among the Indians, and at the same time strengthen Spanish authority throughout the country. The period of most active mission building dates from 1715, though some of them were established earlier. The most important missions were San José, Concepcion, and Alamo, all now in San Antonio and suburbs, and San Saba, in Menard co. In 1794 the supreme authority in these missions was taken from the priests and given to the civil authorities. The policy of Spain had been to prohibit all immigration into Texas from the United States, but in 1820 a large grant of land was made to Moses Austin upon condition that he settle upon it 300 American families. He died a few months afterward, but the grant was renewed to his son, Stephen F. Austin.

Under this contract, and later ones, Austin brought, in all, 1,200 families to Texas. Similar contracts were made by DeLeon, Dewitt, Edwards, and others, and by 1830 there were about 20,000 Americans in Texas. Spanish authority had been overthrown in Mexico, and Bustamante, President of the Republic of Mexico, forbade further immigration of Americans into Texas. After five years of turmoil and misgovernment, the Texans raised an army to secure a correction of their wrongs. During this period of agitation several engagements occurred between Texan troops and the Mexicans. On March 2, 1836, a declaration of independence was adopted, and on April 21, following, the final battle of the Texan Revolution took place at San Jacinto (*q. v.*), when Sam Houston, with about 700 Texans, completely routed Santa Anna, the Mexican dictator, with about 1,600 men, Santa Anna himself being among the captured. During the war had occurred two of the most noted massacres in all history, at the Alamo (*q. v.*), in

Texas

which every one of the 183 heroic defenders was slain, and at Goliad, in which nearly 300 Texan and American prisoners were slaughtered. After continuing nearly ten years as an independent republic, Texas voluntarily applied for admission into the American Union. She was admitted Dec. 29, 1845, and war with Mexico followed as a result of the dispute over the boundary of Texas, the United States claiming the Rio Grande, and Mexico the Nueces, as the boundary. In 1861 Texas seceded and joined the Southern Confederacy. Sam Houston, governor at the time, refused to approve this action; his office was thereupon declared vacant, and the lieutenant governor was sworn in as governor. The State lay outside the main scenes of hostilities. Galveston was captured and held by a Union force for three months in the winter of 1862, and the last battle of the war was fought, near Palo Alto, on the Lower Rio Grande, a month after Appomattox. The Reconstruction Acts of 1867 placed the State under military rule, with General Sheridan in command, and the State was the prey of carpetbaggers for the next three years. Texas was readmitted to the Union on March 30, 1870. It is invariably Democratic.

Population.—The population of Texas numbered 212,592 in 1850; 604,215 in 1860; 818,579 in 1870; 1,591,749 in 1880; 2,235,527 in 1890; 3,048,710 in 1900, or 12 per square mile; and 3,536,618 (Fed. est.) in 1906, or 13 per square mile. In 1900 there were 2,426,669 (79.6 per cent.) whites; 620,722 (20.4 per cent.) negroes; 470 Indians; and 849 Mongolians. There were 2,869,353 (94.1 per cent.) natives and 179,357 (5.9 per cent.) foreign born. The number of illiterates at least 10 years of age in 1900 was 314,018, of whom 146,487 were whites and 167,138 negroes. The population at least 10 years of age, in 1900, engaged in gainful occupations numbered 1,033,033 (out of a total population of that age numbering 2,163,913), of whom 892,641 were males and 140,392 were females. Of these, 644,634 engaged in agricultural pursuits; 40,207 engaged in professional service; 156,413 engaged in domestic and personal service; 111,612 engaged in trade and transportation; and 80,167 engaged in manufacturing and mechanical pursuits. In 1900 the distribution of the population was as follows: 2,527,951 (82.9 per cent.) lived in the country, and 520,759 lived in places with populations numbering 2,500 and upwards. Of the latter, 65,833 (2.2 per cent. of total population) lived in places of 2,500 to 4,000 population; 111,064 (3.6 per cent.) in places of 4,000 to 8,000; 138,793 (4.6 per cent.) in places of 8,000 to 25,000; and 205,069 (6.7 per cent.) in cities of 25,000 to 100,000 population.

J. C. Lattimore.

Texas, University of, a State institution, located at Austin, with a medieal department at Galveston. The university is coeducational; it consists of the college of arts, and the departments of law, medicine, edueation, and engineering. The congress of the Republie of Texas in 1839 passed acts locating the site at Austin, and appropriating fifty leagues of land to its support. Establishment was provided for by the State legislature in 1858, but the Civil War delayed the plans. The constitution of 1876 added one million acres to its endowment, and another million aeres were added in 1883. The university was formally opened in 1883, sessions being held in the temporary capitol building till January, 1884, when the university building was oceupied. The prineipal buildings are the Main building, the Woman's hall, University hall, and the Engineering building. The new Law building was ready for oceupancy in 1907. Government is vested in a board of regents, nominated by the governor and confirmed by the Senate. The university has productive funds exceeding $2,000,000; grounds and buildings valued at over $1,000,000; scientific apparatus, etc., $400,000; annual income, about $340,000; volumes in the library, about 70,000; average number of faculty, 88; average student attendance, 2,500; graduates, over 2,600.

Texas Agricultural and Mechanical College, a State institution, located at College station, Brazos co., near Bryan. It was provided for by an aet of Congress in 1862, approved by the Texas legislature in 1871. Accordingly, 180,000 aeres of land were sold for $174,000 and the amount invested in Texas 7% gold frontier bonds. In the same year an act providing for establishing the college was approved and $187,000 appropriated for neeessary buildings. The college was formally opened in 1876, and since that time has enjoyed ever-inereasing growth and popularity. The government is vested in eight directors appointed by the governor for the term of two years. Immediate eontrol is given over by these directors to the president and faculty. The college has 17 departments, among which are agrieulture, engineering, mathematies, and the languages; average number of faculty, 50; average student attendance, 800; grounds and buildings valued at $730,000.

Texas Christian University, an institution located at Waeo, Tex. A private college was opened at Thorp Spring, Tex., in 1873 by J. A. Clark and his sons, Addison and Randolph, and combining the names of the sons, it was called Add-Ran College. This eollege with its ample buildings and grounds became the property of the Diseiples in Texas in 1889, and the name was changed to Add-Ran Christian University. It was still eonducted by the Clarks, and did exeellent work. In 1895 the property of the Waco Female College, at Waco, Tex., was purehased, and Add-Ran Christian University was removed to this new location. Here it has perhaps the largest main eollege building west of the Mississippi river, and has added several other buildings. In 1902 the name was again changed to Texas Christian University, and its growth has been steady and permanent. In addition to the usual elassical and seientifie courses, it provides a theological course and training in musie, art, oratory, and business. It has an exeellent gymnasium and natatorium, is beautifully situated on a eommanding eminence within the city limits, and is espeeially notable for healthfulness and attraetiveness. It eonfers the degrees A. B., A. M., and B. D., and is open both to young men and to young women. The university has grounds and buildings valued at over $250,000; productive funds, $50,000; average faeulty, 25; average students, 375. CLINTON LOCKHART.

Texel, an island belonging to the province of North Holland, at the entranee to the Zuider Zee. It is separated from the mainland by a narrow strait, called the Marsdiep, contains about 35,000 aeres of arable and pasture lands, and has a population of about 6,000 inhabitants, who keep some 35,000 sheep, famous both for their wool and their cheese. The Marsdiep ehannel or part of it is also often ealled the Texel; and here or hereabouts many important naval battles have been fought. Blake defeated Tromp and De Ruyter in 1653; Prinee Rupert fought De Ruyter in 1673; Duncan blockaded the Texel (for a time with a single ship) in 1797; and a Dutch fleet of twelve ships of war and thirteen Indiamen surrendered to Admiral Mitehell in 1799.

Texier, Charles Félix Marie, a Freneh arehæologist; born in Versailles, France, Aug. 29, 1802. He wrote: "Deseription of Asia Minor: Fine Arts, Historie Monuments, Plans of Ancient Cities," etc. (1839); "Deseription of Armenia, Persia, Mesopotamia" (1842); "The Ancient Ports at the Mouth of the Tiber" (1858); "Byzantine Arehitecture" (1865). He died in Paris, July 1, 1871.

Textus Receptus, in Biblieal critieism, a received text; one from whieh, as being the best aeeessible, translators make their version into the vernaeular. The textus reeeptus of the Old Testament is the Hebrew text, from which the Authorized English Version of that portion of the Bible was made. The textus reeeptus of the New Testament is the Greek text, from which the Authorized English Version was produced. The term textus might also, without impropriety, be used of the Hebrew and Greek texts chosen by the revisers as the basis of the Revised Version. The textus receptus of the Old Testament in the Authorized Version rested on the Hebrew

Masoretic Text, which has come down in manuscripts of no great antiquity, and all of the same family or recension. The oldest Hebrew manuscript of which the age is known bears date A. D. 916.

Tezcuco, or **Tezcoco,** a lake of Mexico, about 2½ miles E. of the city of Mexico, 15 miles long and 9 miles in its greatest width. It was formerly much more extensive and contained numerous islands, on which the old city of Mexico was built. Its waters are strongly impregnated with salt. Also a town on the above lake, 16 miles E. N. E. of Mexico, anciently of considerable importance, of which only the ruins of its palaces and temples remain. It contains numerous handsome modern edifices. Pop. about 6,000.

Thaarup, Thomas, a Danish poet; born in Copenhagen, Denmark, in 1749. Some of his dramatic compositions, among them "The Birthday" and "Peter's Wedding," are regarded as equal to the best in Danish literature. His "Song of Love and Fatherland" ranks as a lyrical classic. He died in 1821.

Thacher, John Boyd, an American reformer; born in Ballston, N. Y., Sept. 11, 1847; was graduated at Williams College in 1869; member of the New York Senate in 1884–1885, when he introduced the measures which resulted in the tenement house reforms; mayor of Albany, N. Y., in 1886–1887, 1896–1897; and chairman of the Bureau of Awards at the World's Columbian Exposition in Chicago in 1893. He was the author of several books, including: "The Continent of America, Its Discovery and Its Baptism"; "Little Speeches"; "The Cabotian Discovery"; etc. Died Feb. 25, 1909.

Thackeray, William Makepeace, an English novelist; born in Calcutta, India, July 18, 1811. At the age of seven Thackeray was sent to England for his education, and was placed at the Charterhouse School, London, afterward continuing his studies at Cambridge. He left the university without taking a degree; and being well provided for he chose the profession of an artist. He spent several years in France, Germany, and Italy, staying at Weimar, Rome, and Paris, but gradually became convinced that art was not his vocation, and having meanwhile lost his fortune, he resolved to turn his attention to literature. His first appearance in this sphere was as a journalist. Under the names of George Fitz-Boodle, Esq., or of Michael Angelo Titmarsh, he contributed to "Frazer's Magazine," tales, criticisms, verses, etc., which were marked by great knowledge of the world, keen irony, or playful humor. It was in this magazine that "The Great Hogarty Diamond," "Yellowplush Papers," and "Barry Lyndon" appeared. In 1840 he published separately the "Paris Sketch-book," in 1841 the "Second Funeral of Napoleon" and the "Chronicle of the Drum," and in 1843 the "Irish Sketch-book." None of these writings, however, attained to any great popularity. In 1841 "Punch" was started, and his contributions to that periodical, among others "Jeame's Diary" and the "Snob Papers," were very successful. In 1846–1848 his novel of "Vanity Fair" was published in monthly parts, with illustrations by himself; and long before its completion its author was unanimously placed in the first rank of British novelists. His next novel was the "History of Pendennis," completed in 1850. In 1851 he delivered a course of

WILLIAM MAKEPEACE THACKERAY.

lectures in London on the "English Humorists of the 18th Century," which were repeated in Scotland and America, and published in 1853. Another novel, "The History of Henry Esmond," appeared in 1852, and was followed by "The Newcomes" (1855), "The Virginians" (1859), a sort of sequel to Esmond; "Lovel the Widower," "The Adventures of Philip," and "Denis Duval," which was left unfinished at his death. In 1855-1856 he delivered a series of lectures in the United States—"The Four Georges," and afterward in England and Scotland. In 1859 he became editor of the "Cornhill Magazine," in which his later novels and the remarkable "Roundabout Papers" appeared, but he retired from that post in 1862. He wrote a good deal of verse, half-humorous, half-pathetic, and often wholly extravagant, but all characterized by grace and spontaneity. He undoubtedly ranks as the classical English humorist and satirist of the Victorian reign, and one of the greatest novelists, es-

sayists, and critics in the literature. A collection of letters by Thackeray was published in 1887. He died in Kensington Palace Gardens, London, Dec. 24, 1863.

Thaer, Wilhelm Albrecht, a German agriculturist; born in Lüdersdorf, near Wriezen, on the Oder, Aug. 6, 1828. He was appointed professor in the University of Giessen, 1871. He is author of a "System of Agriculture" (1877); "Ancient Egyptian Husbandry" (1881); "Weeds in Rural Economy" (1881); "Researches in Tenant-Farming" (1890).

Thais, a famous Athenian courtesan. She accompanied Alexander, who, during an orgy, was persuaded by her to destroy the city of Persepolis. After the death of the Macedonian conqueror, she became the wife of Ptolemy, King of Egypt.

Thalamephorus, or **Thalamephoros,** in Egyptian antiquities, a kneeling figure supporting a shrine or inscribed tablet. These statues probably represent priests and initiated women who carried about in processions the statues of the gods. It was usual for such processions to stand still from time to time, when the priests, kneeling probably, presented to the people the images of the deities, either to be worshiped or kissed.

Thalamifloræ, a class of exogenous or dicotyledonous plants in which the petals are distinct and inserted with the stamens on the thalamus or receptacle.

Thalassicollida, in zoölogy, a family of *Radiolaria.* The animals consist of structureless cysts containing cellular elements and protoplasm, surrounded by a layer of protoplasm giving off pseudopodia, which commonly stand out like rays, but sometimes run into another, and so form networks. The best known genera are *Thalassicolla, Sphærozoïm,* and *Collosphæra.* They are all marine, being found floating passively on the surface of most seas, and vary in size from an inch in diameter downward.

Thalassicollina, an approximate synonym of THALASSICOLLIDA (*q. v.*).

Thalassinidæ, in zoölogy, a widely distributed family of macrurous Decapoda. Abdomen long, not very solid, carapace small and compressed; first pair of legs large; sternal plate long and narrow.

Thalassiophyllum, in botany, a genus of algals, akin to *Laminaria,* but having the frond spirally wound around the stem. Found on the N. W. shores of Arctic America.

Thalassochelys, in zoölogy, the loggerhead turtle; a genus of *Cheloniidæ,* equivalent to the genus *Caouana* of older authors, with two or three species from tropical seas. Plates of the carapace not imbricated; 15 plates on the disk; jaws slightly curved toward each other at their extremity.

Thalassophryne, in ichthyology, a genus of *Batrachidæ,* with two species, from the Atlantic and Pacific coasts of Central America. The spinous dorsal is formed by two spines only, each of which is hollow, like the opercular spine, and conveys the contents of a poison bag situated at the base. The poison bags have no external muscular layer, and are situated immediately below the thick, loose skin which envelops the spines; the ejection of the poison can therefore only be effected by the pressure to which the poison bag is subjected the moment the spine enters another body.

Thalberg, Sigismond, a Swiss pianist; born in Geneva in 1812, where he received his early education under the supervision of his mother, the Baroness Wetzlar. At the age of 10 he was removed to Vienna, where he continued his studies, showing a special aptitude for languages and music, in which subjects he received instruction from the best masters, as his father destined him for a diplomatic career. Thalberg's first appearance as a pianist was at the age of 14, when he played at an evening party at Prince Metternich's. This success was followed up by numerous appearances in Paris, till, overcoming his father's scruples, he was allowed to abandon diplomacy for music. He made tours in 1839 through Belgium, Holland, England, and Russia, and afterward through Spain, Brazil, and North America, finally settling down at Naples in 1858. Thalberg married Madame Boucher, daughter of the celebrated Lablache and widow of a Parisian artist. His musical compositions comprise more than 90 numbers, principally fantasies and variations. His operas "Cristina" and "Florinda" — the latter played before the queen in London in 1851 — were absolute failures. As a pianist, in graceful and brilliant execution and in manual dexterity, he had scarcely a rival. It is said that the under tips of his fingers were "real little cushions," which were used with such effect in producing wonderful legatos that Liszt once made the remark: "Thalberg is the only artist who can play the violin on the keyboard." He died in Naples April 27, 1871.

Thaler, a silver coin circulated in some of the states of Germany, of the value of about 71 cents.

Thales, the earliest of the Greek philosophers, called the father of philosophy; bon in Miletus 640 B. C. He was the founder of the Ionic school, one of the chief sources of Grecian philosophy. He visited Egypt for instruction in the sciences professed by the priesthood. Besides abstract philosophy, he studied geometry and astronomy, and tradition credits him with predicting a solar eclipse. His ancient biographers mention among his services to astronomy a calculation of the length of the year,

and of the interval between solstices and equinoxes. He left nothing in writing. He died about 550.

Thalia, one of the nine Muses. She was the patron of comedy, and is usually represented with the comic mask and the shepherd's crook in her hand. One of the Graces was also called Thalia.

THALIA.

Thalictrum, in botany, meadow-rue; a genus of *Ranunculaceæ*, tribe Anemoneæ. Involucre none; sepals four or five, imbricated in æstivation; corolla wanting; stamens many; styles several; achenes sessile, or nearly so, usually acute at both ends, awnless. Known species 50, from the temperate and colder parts of the Northern Hemisphere. Three familiar species are *T. alpinum*, the Alpine; *T. minus*, the lesser; and *T. flavum*, the common meadow-rue. The most common is *T. minus*. It has three or four pinnate leaves, with roundish or wedge-shaped leaflets, trifid and toothed, and diffuse panicles of generally drooping flowers. It is found in stony pastures, especially in limestone or chalky districts. There are four sub-species. The root of *T. foliolosum*, from the temperate parts of the Himalayas, is given in India as a tonic and aperient in convalescence after fever, in chronic dyspepsia, etc.

Thalite, in mineralogy, a variety of saponite occurring in amygdaloidal rocks on the N. shore of Lake Superior.

Thalium, in mineralogy, a name given to a supposed new element which apparently has no existence.

Thalleiochin, in chemistry, dalleiochin; a green substance produced by the action of chlorine and then ammonia on a solution of quinine. In dilute solutions it remains dissolved as a bright emerald green color, and forms a highly delicate test for the presence of small quantities of quinine.

Thallene, a solid hydrocarbon isomeric with anthracene obtained from the last products which pass over in the distillation of American petroleum. It is distinguished by a green fluorescence, and, when illuminated by violet and ultra-violet light, exhibits a fluorescent spectrum containing light-green bands.

Thallium, in chemistry, a triad metallic element discovered by Crookes in 1861, and widely distributed as a constituent in iron and copper pyrites, in blende, native sulphur, and in many kinds of ores; symbol Tl., at. wt. 203.64. It can be distilled with the sulphur by heating pyrites to a bright-red heat, then dissolving out the excess of sulphur by boiling with caustic soda, collecting and washing the sulphide of thallium, converting it into sulphate, and precipitating the thallium in the metallic state by the action of pure metallic zinc. The spongy metal is compressed, dried, and fused into a bright metallic button by heating under cyanide of potassium. It is a perfect metal, with high luster, not quite so white as silver, but free from the blue tinge of lead. It has a sp. gr. of 11.80–11.91, melts at 293°, is a very soft metal with less tenacity than lead, and almost devoid of elasticity. It communicates an intense green hue to a colorless flame, and its spectrum consists of one intensely brilliant and sharp green line, coinciding with the number 1442.6 on Kirchoff's chart.

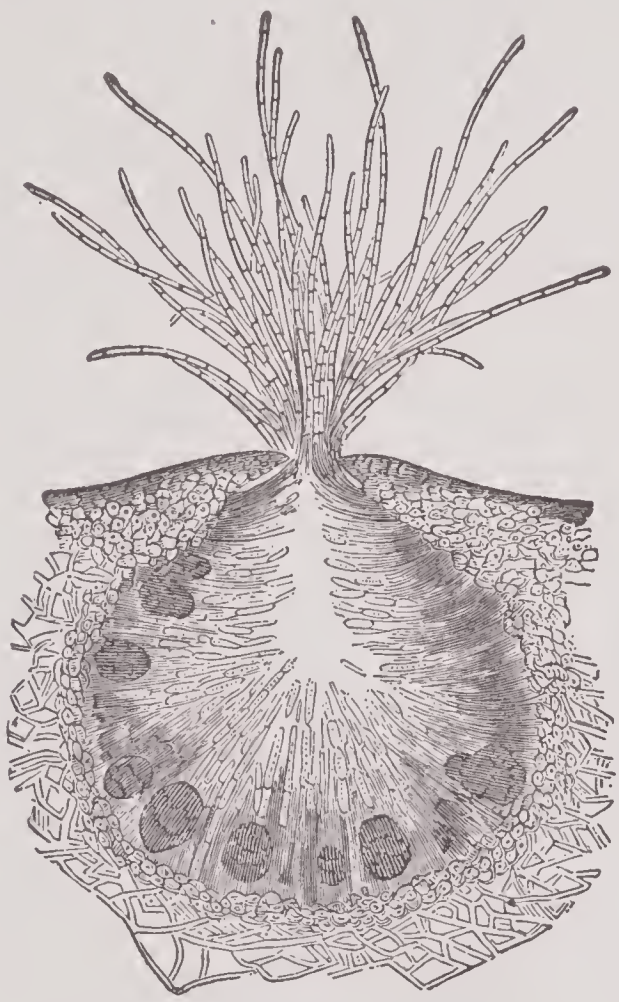
Thallium Chloride. Thallium forms four chlorides: (1) Dichloride of thallium, Tl_2Cl_4; a pale yellow compound formed by carefully heating the protochloride in a slow current of chlorine. (2) Sesquichloride of thallium, Tl_2Cl_3; produced by dissolving thallium in nitro-muriatic acid. It separates in yellow crystalline scales, and dissolves in 380 times its weight of water at 15.5°. (3) Thallic chloride, $TlCl_3$; formed by dissolving the trioxide in hydrochloric acid. The hydrated chloride can be obtained in long colorless prisms, which melt easily and decompose at a high temperature. (4) Thallious chloride, TlCl; formed by adding hydrochloric acid to a thallous salt. A white curdy precipitate resembling chloride of silver is produced, which dissolves like chloride of lead in boiling water. It is insoluble in alcohol.

Thallium Ethers, compounds formed by the action of thallium on alcohols, *e. g.*, thallium-ethylate $= C_2H_5TlO$; produced when thallium and ethylic alcohol are heated in a sealed tube to 100°. Being freed from excess of alcohol, it remains as an oil of sp. gr. 3.48–3.55, being the heaviest liquid known except mercury. It dissolves in five parts absolute alcohol, in pure ether, and chloroform.

Thallium Glass, a glass of great density and refracting power, in the preparation of which thallium is used instead of lead or potassium.

Thallium Oxide. Thallium forms two oxides: (1) Thallious oxide (protoxide),

Tl_2O; prepared by allowing the granulated metal to oxidize in moist air, boiling in distilled water, and repeating the process two or three times. The hydrated oxide crystallizes out in yellow needles. The anhydrous oxide forms a reddish black mass, and is obtained by exposing the hydrated oxide in a vacuum over sulphuric acid. In water it forms a strongly alkaline solution, which dissolves the skin and stains the nails a deep brown. Like potash, it decomposes the salts of the alkaline earths and metals. (2) Thallic oxide (peroxide), Tl_2O_3; the chief product of burning the metal in oxygen. The anhydrous oxide is a dark-brown powder, neutral to test paper, insoluble in water and alkalies, but dissolves readily in acids, forming unstable salts.



THALLOGENS.

Section of receptacle of *Fucus platycarpus*, lined with filaments containing antheridial cells and sporangia.

Thallium Salts, in chemistry, both oxides of thallium form, with acids, definite and crystallizable salts, none of which is of much importance.

Thallium Triamine, N_3TlH_6; known in combination as a hydrochlorate, $N_3TlH_6 \cdot 3HCl$, a compound formed by dissolving thallic oxide in sal-ammoniac. By the action of water it is again resolved into thallic oxide and sal-ammoniac.

Thallochlore, a name applied by Knop and Schnedermann to the green coloring matter of lichens, which they regard as different from ordinary chlorophyll.

Thallogens, one of the primary divisions of the vegetable kingdom, comprehending those cryptogamous plants which are extremely simple in their structure, and possess nothing like the green leaves of phanerogamous plants. They have no woody fiber properly so called, being mere masses of cells. Thallogens include algæ, characeæ, fungi, and lichens.

Thalloid Hepaticæ, in botany, hepaticæ having a thallus, as distinguished from those which have leaves. They possess a well marked epidermis, having a few scattered stomates, and putting out rhizoids from its under side.

Thallus, in botany, a solid mass of cells, or cellular tissue without woody fiber, consisting of one or more layers, usually in the form of a flat stratum or expansion, or in the form of a lobe, leaf, or frond, and forming the substance of the thallogens.

Thalurania, wood nymphs; a genus of *Trochilidæ*, with 11 species extending from Brazil to Ecuador, ranging N. as far as Costa Rica. Wings and tail of moderate size, the latter forked; bill moderate and slightly curved; tarsi clothed with feathers.

Thamnocalamus, in botany, a genus of *Bambusidæ*. *T. spathiflorus* is a small bamboo, growing in the Himalayas, and yielding a fiber.

Thamnophilinæ, American bush shrikes; a sub-family of *Formicariidæ*, with 10 genera, from the forest districts of equatorial America. Bill long, keel arched, tip hooked, base with bristles; wings moderate; tail long; tarsi broadly scaled; outer toe united to middle at base.

Thamnophilus, the type genus of *Thamnophilinæ*, with 47 species, from tropical America. Nostrils at side of base of bill, rounded and exposed; wings rounded, fourth to seventh quills longest; tarsi with transverse scales before and behind.

Thamyn, in zoölogy, the *Rucervus eldi*, Eld's deer, so called from Captain Eld, who discovered it in 1838. It abounds in the swamp lands of Burma, and extends as far E. as the island of Hainan. It differs from the swamp deer only in the form of its antlers, the royal being represented by a small snag.

Thames, the most important river of Great Britain; usually said to rise about 3 miles S. W. of Cirencester in Gloucestershire, near a bridge over the Thames and Severn canal, called Thameshead Bridge, but is more properly formed by the Isis, Churn, Colne, and Leach, which have their sources on the E. side of the Cotswold Hills, and unite near Lechlade, where the counties of Gloucester, Wilts, Berks, and Oxford bor-

der on each other. Proceeding from Lechlade, where it becomes navigable for barges, it flows first E. N. E., then S. S. E., past Oxford and Abingdon to Reading, then N. W. past Great Marlow, and S. E. past Windsor to Staines. From Staines it pursues a circuitous course E., passing the towns of Chertsey, Kingston, Richmond, and Brentford, separating the counties of Middlesex and Surrey, and passing through London. Below London its course E. to the Nore, between Kent and Essex, is 47 miles. Its total course is estimated at 250 miles. Its tributaries include the Windrush, Cherwell, Thame, Colne, Brent, Lea, and Roding, on the left; the Kennet, Loddon, Wey, and Mole, on the right. Thameshead Bridge is 376 feet above sea-level; the junction of the Colne above Lechlade is 243 feet. At London Bridge the width of the river is 266 yards, at Woolwich 490 yards, at Gravesend 800 yards, and 3 miles below, 1,290 yards. The basin of the Thames has an area of 5,400 square miles, and belongs entirely to the upper part of the Secondary and to the Tertiary formations. The depth of the river in the fair way above Greenwich to London Bridge is 12 to 13 feet, while its tides have a mean range of 17 feet and an extreme rise of 22 feet. By means of numerous canals immediate access is given from its basin to those of all the great rivers of England.

Thamugas, "the Numidian Pompeii," near the Aures Mountains, in Algeria; 22 miles from Batna, which is half-way by rail from Constantine to Biskra. Here are in the solitude extensive remains of colonnades, temples, a forum, a triumphal arch in honor of the Emperor Trajan (founder of the city), and numerous statues and inscriptions coming down to the 5th century, when the Roman city was destroyed by the barbarians.

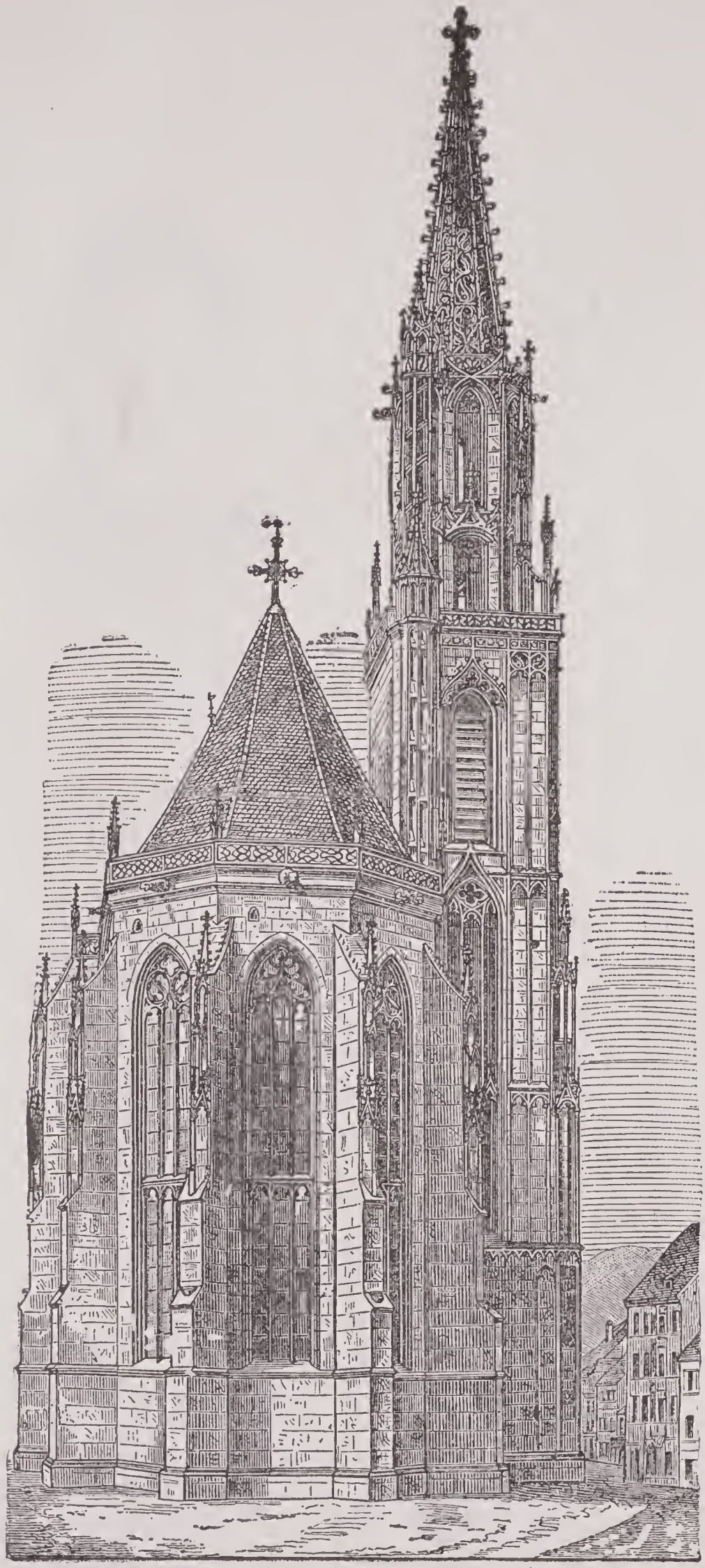
Thane, a title of honor or dignity among the Anglo-Saxons. In England a freeman not noble was raised to the dignity of a thane by acquiring a certain amount of land (five hides in the case of a lesser thane), by making three sea voyages, or by receiving holy orders. The thanes had the right of voting in the Witenagemot, not only of their own shires, but also of the whole kingdom, on important questions. There were two orders of thanes: The king's thanes, or those who attended at his court and held lands immediately from him, and ordinary thanes, or lords of the manor, and who had a particular jurisdiction within their limits. On the cessation of his actual personal service about the king, the thane received a grant of land. After the Norman conquest, thanes and barons were classed together, and the title fell into disuse in the reign of Henry II. In Scotland, thane signified originally a count or earl, one who ruled a county, or even in some cases a province. Afterward the title was applied to a class of non-military tenants of the crown, and continued in use till the end of the 15th century.

Thanet, Octave, pseudonym of ALICE FRENCH, an American novelist; born in Andover, Mass., March 19, 1850. She published: "Knitters in the Sun"; "Otto the Knight"; "Stories of a Western Town"; "An Adventure in Photography"; "Expiation"; "The Heart of Toil"; "A Slave to Duty."

OCTAVE THANET.

Thanet, Isle of, a district of England, in the county of Kent, at the mouth of the Thames; separated from the mainland by the Stour river on the S. and the Nethergong on the W., with an area of 26,500 acres. On its shores are the well-known watering places Ramsgate, Margate, and Broadstairs; and on the North Foreland, in the N. E. is a lighthouse, 85 feet high, visible 19 miles. Pop. 50,821.

Thanksgiving Day, in the United States, an annual festival of thanksgiving for the mercies of the closing year. Practically it is a National harvest festival, fixed by proclamation of the President and the governors of States, and ranks as a legal holiday. In 1789 the Episcopal Church formally recognized the civil government's authority to appoint such a feast, and in 1888 the Roman Catholic Church also decided to honor a festival which had long been nearly universally observed — though nowhere with such zest as in the New England States, where it ranks as the great annual family festival, taking the place which in England is accorded to Christmas. The earliest harvest thanksgiving in America was kept by the Pilgrim Fathers at Plymouth in 1621, and was repeated often during that and the ensuing century; Congress recommended days of thanksgiving annually during the Revolution, and in 1784 for the return of peace — as did President Madison in 1815. Washington appointed such a day in 1789 after the adoption of the Constitution, and in 1795 for the general benefits and welfare of the nation. Since 1817 the festival has been observed annually in New York, and since 1863 the Presidents have always issued



THANN: CHURCH OF ST. THEOBALD.

proclamations appointing the last Thursday in November as Thanksgiving Day.

Thann (tän), a town of Upper Alsace, Germany; on the Thur river; 23 miles S. W. of Kolmar. It dates back to 995 and in 1325 became the property of the House of Hapsburg. In 1632 it was captured by the Swedes (during the Thirty Years' War) and in 1675 the French under Turenne blew up the castle of Engelburg, the ruins of which overlook the town. Thann has manufactures of silk, cotton, chemicals, and machinery, and contains the beautiful church of St. Theobald (Roman Catholic) with a spire of delicate openwork 325 feet high.

Thapsia, the deadly carrot; the typical genus of *Thapsidæ*. Perennial herbs with doubly or trebly pinnate leaves, and large compound umbels of yellow flowers, without involucres or involucels. *T. garganica* is found in the S. of Europe and Northern Africa; *T. silphion* is a variety of it rather than a distinct species. *Thapsia* is a powerful rubefacient, and is used in medicine in the form of a sparadrap.

Thaso, the ancient Thasos, an island in the Ægean Sea, a few miles S. of the Macedonian coast, belonging to Turkey. It is of a circular form, about 16 miles in diameter, and is traversed by high woody hills which yield large quantities of timber.

Thatch, straw, or any other dry vegetable substance, laid on the top of a building, rick, etc., to keep out the wet. There are many different materials for thatching, but the straw of wheat and rye when well laid form the neatest and most secure covering for general purposes. The reed, though expensive, is a highly valuable article for the purpose of thatch, where a lasting roof is required.

Thatcher, Henry Knox, an American naval officer; born in Thomaston, Me., May 26, 1806; entered the navy as a midshipman in 1823; became a passed midshipman in 1829; lieutenant in 1833. He served in various parts of the world; and in 1855 attained the rank of commodore. He was in command of the sloop "Decatur" of the Pacific station; ordered to the sailing-sloop "Constellation" on the Mediterranean station; and in 1862 commanded the first division of Commodore Porter's fleet in both attacks on Fort Fisher. After the war he commanded the Gulf Squadron till 1866 and the Pacific Squadron in 1866–1868; promoted rear-admiral in July, 1866; retired in 1868; and was port-admiral at Portsmouth, N. H., in 1869–1871. He died in Boston, Mass., April 5, 1880.

Thatcher, Oliver Joseph, an American historian; was graduated at Wilmington College, O., in 1878, and at the Union Theological Seminary in 1885; studied abroad in 1885–1888; was Professor of Ecclesiastical History at the United Presbyterian Theological Seminary in 1890–1892. He became assistant Professor of History at the University of Chicago in 1893, and was made associate Professor of Mediæval and English History there in 1896. His publications include: "A Sketch of the History of the Apostolic Church" (1894); "Europe in the Middle Age" (with F. Schwill, 1896); "A Short History of Mediæval Europe" (1897); and "A General History of Europe, 350–1900" (with F. Schwill, 1900).

Thaumantías, in zoölogy, a genus of *Medusidæ*. Body hemispherical, its circumference with tentaculiform cirrhi, bulbous at their root, the under part of the animal much excavated, with a stomachical cavity terminating by a buccal orifice. From the European and Australian coasts.

Thaumas, in palæontology, the name given to some extinct forms from the Oölite, closely allied to *Rhina squatina*, the angel fish, and probably to be classed with the *Rhinidæ*.

Thaumasite, an amorphous mineral occurring in crevices in the Bjelke mine, Jemtland, Sweden. When first found it is stated to be soft, hardening on exposure. Hardness, 3.5; sp. gr., 1.877; luster, greasy to dull; color, white. Composition: A mean of three very concordant analyses appears to justify the formula suggested by Lindström, $CaSiO_3 + CaCO_3 + CaSO_4 + 14$ aq., which needs silica, 9.93; carbonic acid, 7.28; sulphuric acid, 13.25; lime, 27.82; water, 41.72 = 100. In view of the improbable composition, it has been attempted to show that the substance is a mixture; but by independent microscopic investigation its practically homogeneous structure has been confirmed. Still further examination is essential.

Thaumastura, in ornithology, the sheartail; a genus of *Trochilidæ*, with two species, from the humid districts of Peru. The genus is distinguished by the peculiarly shaped tail, the feathers of which are pointed, the middle ones being greatly elongate. Several pairs are generally met with together. The males are extremely pugnacious, driving off every other kind of humming bird which ventures to enter their territory. The plumage of the sexes is different, the female being much duller in color.

Thausing, Moritz (tou'sing), an Austrian art critic; born in Leitmeritz, in Bohemia, June 3, 1838. He became Professor of the Science of Æsthetics in the University of Vienna, 1873. He wrote: "Dürer: History of His Life and His Art" (1876); "J. J. Callot's Sketch-Book" (1881); "Art Letters from Vienna" (1884). He died in Leitmeritz Aug. 14, 1884.

Thaxter, Mrs. Celia (Leighton), an American poet; born in Portsmouth, N. H., June 20, 1836. She spent her childhood and most of her later life at the Isles of Shoals. Her works are: "Poems" (1872); "Among the Isles of Shoals" (1873); "Poems" (1874); "Drift Weed" (1879); "Poems for Children" (1884); "The Cruise of the Mystery," etc. (1886); "Idyls and Pastorals" (1886); "The Yule Log" (1889); "An Island Garden" (1894); "Letters" (1895); "Stories and Poems for Children" (1895). She died on the island of Appledore, Isles of Shoals, Aug. 26, 1894.

CELIA THAXTER.

Thayer, Alexander Wheelock, an American writer on music and musicians; born in 1817. He contributed to the "Dictionary of Music"; was musical critic of the New York "Tribune"; afterward was consul at Trieste, 1859–1897. He published: "Signor Masoni," etc. (1862); "The Hebrews and the Red Sea" (1883); and three volumes of "Life of Beethoven" (1866–1887). He died in Trieste July 15, 1897.

Thayer, Eli, an American educator; born in Mendon, Mass., June 11, 1819; was graduated at Brown University in 1845, and soon afterward became principal of the Worcester Academy. He founded the Oread Institute, a school for girls, in Worcester, Mass., in 1848; served for several years as a member of the Worcester School Board; became alderman of that city in 1853; and was a member of the State Legislature in 1853-1854. While there he originated and organized the "Emigrant Aid Company," and labored till 1857 to obtain the support of the Northern States for his plan to send anti-slavery settlers to Kansas. He was a member of Congress in 1856-1861, when he made his famous speeches on "Central American Colonization," "Suicide of Slavery," and the admission of Oregon. While the Civil War was in progress he proposed a plan for the military colonization of Florida as a war measure. Subsequently he urged his colonization scheme as a remedy for polygamy in Utah; wrote and published several books; and invented a hydraulic elevator, a safety steam boiler, and an automatic boiler cleaner. He died in Worcester, Mass., April 15, 1899.

Thayer, Emma Homan, an American author; born in New York city, Feb. 13, 1842; was educated at Rutgers College and took a course in art at the National Academy of Design, New York city, where she exhibited numerous figure paintings; settled in Colorado in 1882; and made sketches of the flora of that vicinity. Her publications include: "Wild Flowers of Colorado" (1885); "Wild Flowers of the Pacific Coast" (1897); "The English American" (1889); "Petronilla, the Sister" (1898); "A Legend of Glenwood Springs" (1900); and "Dorothy Scudder's Science" (1901). She died in 1908.

Thayer, James Bradley, an American educator; born in Haverhill, Mass., Jan. 15, 1831; was graduated at Harvard College in 1852 and at its law school in 1856; admitted to the bar in Boston the same year and practised there till 1873, when he became Royall Professor of Law at Harvard University. Professor Thayer was the author of many well-known law books. He died in Cambridge, Mass., Feb. 14, 1902.

Thayer, Joseph Henry, an American educator; born in Boston, Mass., Nov. 7, 1828; was graduated at Harvard University in 1850 and at the Andover Theological Seminary in 1857; preached in Salem, Mass., in 1859-1864; was Professor of Sacred Literature at Andover Theological Seminary in 1864-1884; and in the latter year became Professor of New Testament Criticism and Interpretation in the Harvard Divinity School. His publications include: "Books and Their Use"; "The Change of Attitude Toward the Bible"; "A Greek-English Lexicon of the New Testament"; "A Biographic Sketch of Ezra Abbott," etc. He died Nov. 26, 1901.

Thayer, Martin Russell, an American jurist; born in Petersburg, Va., Jan. 27, 1819; was graduated at the University of Pennsylvania in 1840, and admitted to the Pennsylvania bar in 1842. He was appointed by the governor to revise the revenue lege in 1807; and the United States Miliber of Congress in 1863-1867; judge of the district court of Philadelphia in 1867; and presiding judge of the Court of Common Pleas in 1874-1896. His publications include: "The Duties of Citizenship"; "The Battle of Germantown"; "The Philippines"; "What Is Demanded of the United States by the Obligations of Duty and National Honor"; and many essays, speeches, reviews, criticisms, etc. He died in 1906.

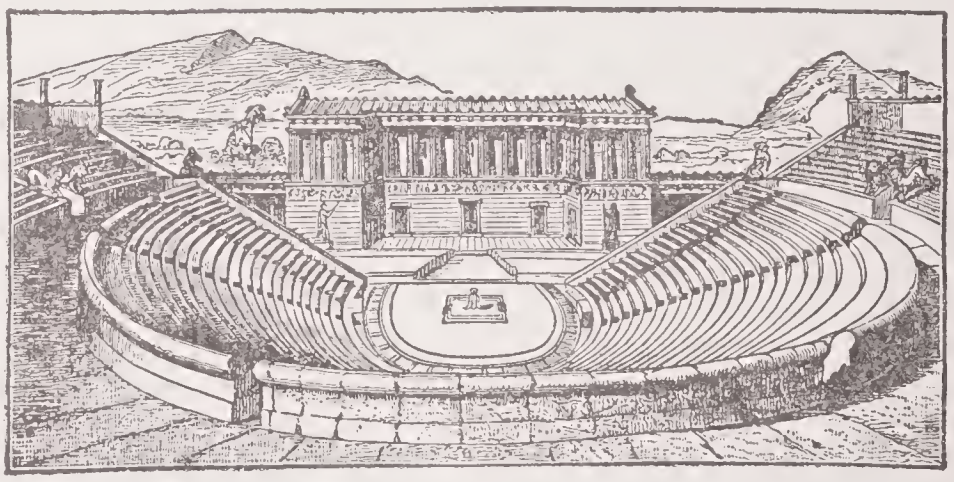
Thayer, Sylvanus, an American military officer; born in Braintree, Mass., June 9, 1785; was graduated at Dartmouth College in 1807; and the United States Military Academy in 1808; and assigned to the Engineer Corps. He was employed on engineer duty on the E. coast, and as an instructor of mathematics at the Military Academy; was promoted 1st lieutenant, July 1, 1812; took part in the War of 1812-1815; was chief engineer on the Niagara frontier, at Lake Champlain, and in the defense of Norfolk, Va.; was promoted captain of engineers in 1813, and brevetted major in 1815 for distinguished services. In 1815 he was sent to Europe to examine military works and schools, and to study the operations of the allied armies before Paris; was recalled in 1817 on being appointed superintendent of the United States Military Academy, which post he held till 1833, when he resigned. During his administration he organized the institution on its present basis. He was brevetted lieutenant-colonel in 1823, major in 1828, and colonel in 1833. In 1838-1863 he was engaged in the construction of defenses in and about Boston harbor. He was promoted lieutenant-colonel of engineers in 1838, colonel in 1863, and brevet Brigadier-General May 31, 1863, and was retired the following day. He was a member of various scientific associations; gave $70,000 to found the Thayer School of Civil Engineering at Dartmouth College; $10,000 to Braintree for a public library; and bequeathed $300,000 for the endowment of an academy in Braintree. He was the author of "Papers on Practical Engineering" (1844). He died in South Braintree, Mass., Sept. 7, 1872. His body was reinterred in West Point, Nov. 8, 1877, where a statue was raised to his honor which bears the inscription, "Colonel Thayer, Father of the United States Military Academy."

Thayer, William Makepeace, an American clergyman; born in Franklin, Mass., Feb. 23, 1820. His books attained great popularity, several being reprinted abroad in German, French, Italian, Greek, Swedish, etc. Among his works are: "The Bobbin Boy" (1859); "The Pioneer Boy" (1863); a Series of Biographers (10 vols. 1859–1863); "Youth's History of the Rebellion" (1863–1865); "White House Stories" (1880–1885); "Marvels of the New West" (1887); "Life of Garfield"; "Men Who Win"; "Women Who Win"; "From the Tannery to the White House"; "In the Meshes"; "Ethics of Success"; etc. He died in Franklin, Mass., April 7, 1898.

Thayer, William Roscoe, an American author; born in Boston, Mass., Jan. 16, 1859; studied in Europe, and was graduated at Harvard University in 1881; became editor of the "Harvard Graduates' Magazine" in 1892. His publications include "Confessions of Hermes" (1884); "The Best Elizabethan Plays" (1890); "The Dawn of Italian Independence" (1893); "Poems, New and Old" (1894); "History and Customs of Harvard University" (1898); and "Throne-Makers" (1899).

Thea. See TEA.

Theater, or **Theatre,** a building devoted to the representation of dramatic spectacles; a play-house. Among the Greeks and Romans theaters were the chief public edifices next to the temples, and many of them were of enormous size. The theater of Marcellus at Rome, the external walls of which are still in existence, contained seats for 30,000 spectators. The Greek theaters were semicircular; that part in which the chorus danced and sang was called the orchestra; behind this, and facing the audience, was the stage for the performers who took part in the drama; the back of the stage being filled in by a permanent architecturally decorated scene. Roman theaters also formed semicircles with seats rising in the form of an amphitheater for the spectators, at the chord of which was the stage (*scena*), with its permanent decorations. The orchestra, which was the space between the stage and the lowest tier of spectators, was employed by the Greeks for theatrical purposes, whereas the Romans turned it into seats for the senators. The topmost tier was generally crowned with a covered portico. The whole mass of the rows of seats was supported by a solid substructure of piers and arches, which formed passages of three stories one above another, retaining the circular form of the building; while externally they formed arcades, which were surrounded with half-columns or piers with entablatures over them. The exterior of the straight portion of the building, which contained the stage and some chambers connected with it, was generally surrounded by a portico. The theaters were either open, or were protected against the sun and rain by an awning stretched over them. The *scena* consisted of the *scena* in a restricted sense, answering to the modern scene, and the *pulpitum* or stage. The scene itself, in accordance with a critical canon observed with much solicitude by the Grecian dramatists, was very rarely changed during the course of the same play, though the *scena versatilis*, the turning scene, and the *scena ductilis*, the shifting scene, were not altogether unknown. The *pulpitum* again was divided into *proscenium*, or space in front of the scene, where the actors stood while actually engaged in the business of the play, and the *postscenium*, or space behind the scene, to which they retired when they made their exits. Modern theaters are generally constructed on a semicircular or horse-shoe plan, with galleries running round the walls. The portion of a modern theater corresponding to the ancient orchestra is occupied mainly by spectators, the orchestra taking up only a small part of it next to the stage.



THEATER AT SEGESTA, RESTORED.

Also, a room, hall, or other place, generally with a platform at one end, and ranks of seats, rising as they recede, or otherwise arranged so as to afford the spectators a full and unobstructed view of the platform. Such rooms are used for public lectures, anatomical demonstrations, surgical operations, etc.

Theatine, in Church history, any member of a congregation of Regular Clerks, which derived its name from Theate (now Chieti), a fortified city of the Abruzzo, of which John Peter Caraffa, one of the founders of the Congregation, was bishop. Associated with Caraffa were St. Cajetan, Paul

Consiglieri, and Boniface de Colle; the first steps toward the formation of the new congregation were taken in 1524, and in the following year it was approved by Pope Clement VII. The object of the founders was the promotion of spiritual life among Christians and the removal of irregularities among the secular clergy. The members took the three vows, and practised rigid poverty, for they even abstained from asking alms. In the popedom of Caraffa, who was elected in 1555, and took the title of Paul IV., the congregation spread over the Continent, but is at present confined to Italy.

Théatre Français, or **Comedie Française,** the theater in the Palais Royal, Paris, in which the classical drama of France receives its most perfect and artistic representation, dates from 1680, when Louis XIV. combined the aetors of the Hotel Bourgogne and Molière's company, and gave them a special organization and a yearly subvention of $2,400. In 1770 the theater was established in the Tuileries, in 1782 was removed to a new building where the Odéon now is, and after the troublous times of the revolution was finally established in the Palais Royal. The present eonstitution dates from 1803. The committee of six, presided over by government offieials, names the *sociétaires* (the aetors and aetresses who belonged to the staff) and the less permanent *pensionnaires*, superintends all financial arrangements, makes a point of reprodueing from time to time the really great Freneh plays, and sits in judgment on new plays submitted. The subvention is now $48,000. The Théâtre Français is remarkable for perfeet study, artistie dignity, and harmonious ensemble. Its bicentenary was celebrated with great éelat in 1880. In 1901 the direetors announeed to the aetors and aetresses that they would not be consulted, as formerly, in the selection of plays.

Theatrophone, a form of the telephone specially adapted for hearing theatrieal performances at a distanee. The apparatus of the "eompagnie du theatrophone" of Paris was exhibited in 1891 at the Savoy Hotel, and by its means the performance of the Nautch Girl at the Savoy theater was said to be well heard.

Thebaine (named from Thebes, in Egypt, from the vicinity of whieh comes some of the opium of commerce), $C_{19}H_{21}NO_3$; thebaia; one of the less important bases existing in opium; obtained by treating the extraet of opium with milk of lime, washing the preeipitate with water, and after drying, exhausting it with boiling alcohol. On evaporation a residue is obtained, from which ether dissolves out the thebaine. It crystallizes from alcohol in quadratic tablets, having a silvery luster, tastes acrid, and is extremely poisonous. It melts at 12.5°, is insoluble in water, very soluble in alcohol and ether, and is colored deep red with sulphuric acid.

Theban Legion, according to tradition, a body composed of Christians, who submitted to martyrdom rather than attack their brethren during the persecution of the Emperor Maximin, or saerifice to the gods, about A. D. 286. Their leader, Maurice, was canonized.

Thebes, the name of a celebrated Egyptian city, formerly the capital of Southern or Upper Egypt; ealled by the Egyptians Tuabu, by the Hebrews No-Amon, by the Greeks Thebæ, and at a later period Diospolis Magna. It lies in the broadest section of the valley of the Nile, in about latitude 26° N., at a spot where the desert on the W. sheers away to the girdling range of the Libyan Mountains, leaving a broad plain, partly eultivated, on whieh stand the famous twin statues, one of whieh is known as the "voeal Memnon," and behind them the temples grouped about the modern distriet of Kurna and Medînet-Habû. The Nile divides this W. part or Necropolis of Thebes, aneiently called the "Libyan suburb," from the extensive ruins now known by the names of the villages Luxor (el-Uksur, "the palaees") and Karnak which stand on the E. bank, with the low range of the Arabian hills for a background.

The traditional foundation of Thebes goes baek to the 1st dynasty, but no buildings have hitherto been found earlier than some slight eonstruetions of the 11th dynasty, 2500 B. C., who appear to have founded the original temple of Amen-Ra, the speeial god of the eity. Its most flourishing period was under the 18th, 19th, and 20th dynasties, or from about 1600 to 1100, when it had supplanted Memphis, the aneient eapital of the Pharaohs. The central situation of Thebes secured it from the attaeks of the N. enemies of Egypt, and eontributed to its prosperity; and here the worship of Amen-Ra arose in all its splendor; magnifieent palaees and temples were built in its different quarters by the great monarehs of the Theban dynasties, and were added to by later kings, down to the time of the Ptolemies and Antonines, to the 2d eentury A. D. It was enriched by the spoils of Asia and the tributes of Ethiopia, and its fame and reputation had reaehed the early Greeks. Homer describes it by the epithet of hundred-gated, doubtless in allusion to the gates or pylons of its temples, for Thebes was never a walled or fortified city.

In the plentitude of its power it sent forth an army of 20,000 war chariots; but about 1100 B. C. the Bubastite and Tanite

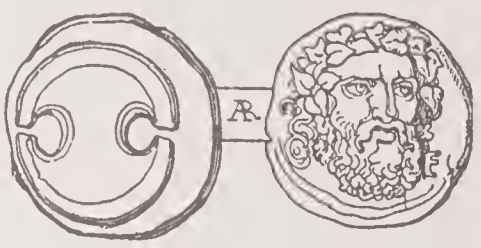
dynasties removed the capital again to the N., to Sais and Memphis, and thenceforth Thebes declined in importance. At the Persian conquest in the 6th century B. C. Cambyses obtained a spoil of nearly $10,000,000 from the city, and destroyed many of its noblest monuments. The foundation of Alexandria still further injured it; and at the time of Strabo Thebes was only a cluster of small villages. Its temples, tombs, and ruins were frequently visited by Greek and Roman travelers, including the Emperor Hadrian. At a later period a considerable Christian population lived there under the empire; but at the Arab invasion the inhabitants fled to Esné. Thebes is now inhabited only by Fellahîn, by a few officials, and by the migratory visitors to the three hotels at Luxor.

Of the monuments on the W. or Libyan side the principal are the three temples of Seti I. and Rameses II. and III., known respectively as El-Kurna, the Rameseum (or Memnonium), and Medînet-Habû. Close to the Rameseum is the fallen and broken colossus of the founder, the largest statue in Egypt, originally nearly 60 feet high, celebrated in Shelley's sonnet as that of Osymandyas, whose palace the temple was believed to represent. Near by are also some remains of two temples of Amenoph III., whose two colossal statues still survey the green fields in front. Some way behind the Rameseum, on a spur of the hills, is a terraced temple of Queen Hatasu (18th dynasty), known as Deyr-el-Bahri, near which a remarkable series of 39 royal and priestly mummies, papyri, etc., were found by Emil Brugsch in 1881. At Medînet-Habû is a pile of buildings, of which the chief is the great temple of Rameses III. (the Rhampsinitus of Herodotus), with sculptures representing his victories over the Philistines, the life in his harem, the riches of his treasury, and a calendar with inscriptions dated in the 12th year of his reign. Near here, to the N. W., are the cemeteries of the sacred apes, and further on the valley of the Tombs of the Queens, consisting of 17 sepulchres, supposed to be the tombs of the Pallacides of Amen, mentioned by Diodorus and Strabo. Near them, among the hills, are the Bibân-el-Mulûk, or Tombs of the Kings of the 19th and 20th dynasties, 16 in number, the most interesting of which are those of Seti I., called Belzoni's, after its discoverer, and of Rameses III., named by Bruce the "Harper's tomb."

On the E. bank the chief monuments are at Luxor, the beautiful temple of Amenoph III. (18th dynasty), added to by Rameses II., with its well-known obelisk, the fellow of which was removed to the Place de la Concorde at Paris; and the still more magnificent temple, or rather group of temples, at Karnak, the sanctuary of which, built by Osirtasen I. of the 12th dynasty, was added to by the monarchs of the 18th. The most remarkable part of this wonderful mass of pylons, courts, and obelisks is the great hall, 170 feet by 329 feet, built by Seti I. and Rameses II., with its central avenue of 12 massive columns, 62 feet high and 12 feet in diameter, and its 122 other columns, and two obelisks (originally four), one of which is the tallest in Egypt, 108 feet high. On the walls the sculptures tell the glorious history of those two warrior kings, how they fought against the Hittites and the Ruten, and the Arabs and the Syrians, and the people of Armenia, and took from them their strong cities. Here, too, is the so-called Portico of the Bubastites, built by Shishak, I., recording his expedition against Jerusalem, 971 B. C.

The Thebaid, the territory of Thebes, was a term applied to various areas at various times, but generally to one of the three main divisions of Egypt. It is specially familiar to us as being a favorite place of retreat for Christian hermits.

Thebes, or **Thiva,** the capital of Bœotia in ancient Greece; founded, according to tradition, by a colony of Phœnicians, under Cadmus, 1550 B. C., or 1400 B. C. They were driven out by the Bœotians, 1124 B. C. Platæa, one of the Bœotian cities, revolted from Thebes 510 B. C., and applied for help to Athens. A war ensued between Thebes and Athens, in which the latter was victorious. This caused much animosity between Thebes and Athens, and in the Persian war, 480 B. C., the Thebans deserted the cause of Greece and fought against the Athenians at Platæa, 479 B. C. The Athenians invaded Bœotia, and established a democratic government in Thebes, 456 B. C. The Thebans were allies of the Spartans in the Peloponnesian war, 431 B. C.–404 B. C. Sparta having claimed supremacy over the whole of Greece, the Thebans joined the Athenians, 395 B. C. The peace of Antalcidas put an end to the war, 387 B. C., and deprived Thebes of her supremacy over Bœotia. The Spartans, who treacherously seized the citadel of Thebes 382 B. C., were defeated at Leuctra, in July, 371 B. C.; and the Thebans regained their power in Greece. Thebes was razed to the ground by Alexander III., 335 B. C., after which it never again formed an independent State. Cassander restored the city 315 B. C., and it was taken by Demetrius 293 B. C., and again 290 B. C. The Thebans were defeated in an



COIN OF THEBES.

attempt to expel the Bulgarians from Greece in 1040, and their city was plundered by the Normans of Sicily in 1146. It was one of the most flourishing cities of Greece during the 10th and 11th centuries. The modern Thebes was almost wholly destroyed by an earthquake in 1893.

Thebolactic Acid, $C_3H_6O_3$; an acid isomeric or identical with lactic, and found in the mother liquors of morphine. It is said that some of its salts differ from those of ordinary lactic acid. Turkey opium yields about 2 per cent. as lactate of calcium.

Theca, in anatomy, a sheath, specifically applied to the sheath inclosing the spinal cord, formed by the dura mater. In botany: (1) An anther. (2) Used in the plural of (*a*) the sporangia, capsules, or conceptacles of ferns; (*b*) the sporangia or capsules of mosses; (*c*) the sporangia, folliculi, or involucres of *Equisctaccæ;* (*d*) the sporocarpia, conceptacles, or capsules of *Lycopodiaceæ;* and (*c*) the asci of lichens and fungals. In palæontology, a genus of *Hyaleidæ.* Shell straight, conical, tapering to a point, back flattened, aperture trigonal. Possibly a sub-genus of *Orthoceras;* 40 species; from the Palæozoic rocks. In zoölogy, a sheath or receptacle; specifically, the wall of a sclerodermic corallum. In some cases it is strengthened by an epitheca.

Thecidæ, in palæontology, a family of *Tabulata,* with a single genus *Thecia,* confined to the Silurian. Corallum compound, septa present, tabulæ well developed. Its precise affinities are obscure, and it should probably be regarded as one of the Alcyonaria.

Thecidium, in botany, Mirbel's name for an achænium. In zoölogy, a genus of *Terebratulidæ,* or *Thecidiidæ.* Shell thickened, with granulated border; fixed to sea bottom by the substance of the beak of the ventral valve; structure punctuated; oral processes united in the form of a bridge over the visceral cavity; curvated arms folded upon themselves, and supported by a calcareous loop. One recent species, *T. radians,* from the Mediterranean; fossil 34, from the Trias onward.

The Brill. See Briel.

Thecla, a virgin saint of the early Church; a member of a noble family of Iconium in Lycaonia, where she was converted by the preaching of St. Paul, and, having devoted herself to a life of virginity, suffered a series of persecutions from her intended bridegroom, as well as from her parents. She is said to have died at the age of 90 in Seleucia. The apocryphal "Acts of Paul and Thecla" were edited by Tischendorf.

Thecla, in entomology, the hairstreak; a genus of *Lycænidæ.* Fore wings wholly dark brown, or with a large blotch of some other color, or with pale markings near the hinder margin; hind wings with a transverse pale line below, which is entire, interrupted, or nearly obsolete. Larvæ feeding on trees, shrubs, or papilionaceous plants. Common in all temperate regions. *T. rubi,* the green hairstreak, has the under side of the wings green; the rest have not this character. *T. betulæ,* the brown hairstreak, has the under side of the hind wings with two slender white streaks. *T. pruni,* the dark hairstreak, has an orange band with a row of black spots; *T. album,* the black hairstreak, a black line; and *T. quercus,* the purple hairstreak, has two small orange spots instead of the band. The first of the five is the most common.

Thecodontia, in palæontology, an order of *Reptilia* founded by Owen. Vertebral bodies biconcave; ribs of trunk long and bent, the anterior ones with a bifurcate head; limbs ambulatory, femur with a third trochanter; teeth with the crown more or less compressed, pointed, with trenchant and finely-serrate margins, implanted in distinct sockets. Two genera, *Thecodontosaurus* and *Palæosaurus,* from the Trias, near Bristol. Huxley regards them as Dinosaurian.

Thecosmilia, in palæontology, a genus of *Actinozoa.* One species from the Rhætic or Lower Lias; from the Jurassic rocks of Great Britain, and others from the Cretaceous and Tertiary.

Thecosomata, in zoölogy, a section of *Pteropoda.* Animal with external shell; head indistinct; foot and tentacles rudimentary, combined with the fins; mouth situated in a cavity formed by the union of the locomotive organs; respiratory organ contained within a mantle cavity. There are two families: *Hyaleidæ* and *Limacinidæ.*

Theine, in chemistry, formula $C_8H_{10}N_4O_2$, an organic base, occurring in tea leaves, in Paraguay tea, guarana, and in small quantities in cocoa seeds. It is also formed synthetically from theobromine by union with methyl, yielding methyl-theobromine, or theine. To prepare it from tea the leaves are extracted with hot water, the solution precipitated with lead acetate, and the filtrate freed from lead by sulphydric acid. On evaporation of the solution and allowing it to stand for some time, the theine crystallizes out. Purified by animal charcoal it forms tufts of white silky needles, slightly soluble in cold water and alcohol, melting at 225°, and subliming unchanged at a higher temperature. Tea leaves contain from 2 to 4 per cent. of theine, to which the stimulating effect of tea is partly ascribed.

Theiner, Augustin, a German canonist; born in Breslau, Silesia, April 11, 1804; was appointed prefect of the Vatican archives, 1855; but was deprived of that office during the Vatican Council on the charge of giving to certain oppositionist bishops secret documents of the curia. His first notable work was a tractate in opposition to the rule of clerical celibacy, "The Introduction of Obligatory Celibacy" (2 vols. 1828). His other principal works are: "History of the Return of the Reigning Houses of Brunswick and Saxony to the Bosom of the Catholic Church" (1843); an edition of Baronius's "Church Annals," with a continuation (1856–1857); "Diplomatic Code of the Temporal Dominion of the Holy See" (1863); "Temporal Sovereignty of the Holy See Judged by the General Councils of Lyons and Constance" (1867). He died in Civita Vecchia, Italy, Aug. 10, 1874.

Theism, etymologically equivalent to belief in a god or gods, and as such opposed to ATHEISM (*q. v.*), is now usually understood to mean the doctrine of the one, supreme, personal God, "in whom we live, and move, and have our being"—as distinguished from POLYTHEISM (*q. v.*), which recognizes more gods than one; from PANTHEISM (*q. v.*), which denies the divine personality; from AGNOSTICISM (*q. v.*), which denies that we can know anything of God; and from DEISM (*q. v.*), which, etymologically equivalent to Theism, is generally defined as recognizing the personality of God, but denying His providence and active presence in the life of the world. Deism further explicitly rejects revelation and trinitarian conceptions of the godhead, while Theism may or may not accept these doctrines.

Theism as the doctrine of the nature and attributes of God covers a large part of the field of theology and speculative philosophy. But in practice it is usually restricted to the maintenance of the thesis that God may be known; the history of the origin and development of the idea of God; and the statement, criticism, and defense of the arguments for the existence of God. The main part of its work is apologetic, in opposition to the hostile systems and theories, rather than a scheme of systematic THEOLOGY (*q. v.*). No competent apologist now stakes the existence of God on any one argument, or exhibits the proof as a series of syllogisms. It is rather maintained that the study of human history, of human nature, especially on its moral and spiritual side, and of the world as far as science reveals it to us make for the existence of a God, demand such a postulate as the key to the universe, and render the belief in a personal God greatly more probable than any other thesis. But it is necessary to name what are often referred to as as the four great arguments for the existence of God. (1) The ontological argument first formulated by St. Anselm proceeds from the notion of a most perfect being to infer his existence; without actual existence the idea would fall short of perfection. The argument was restated in a different shape by DESCARTES (*q. v.*) and by Samuel Clarke, and, though very contemptuously treated by Kant, is still an element of the argument that without a God the world is a chaos.

(2) The cosmological argument, employed by Aristotle, Aquinas, and a host of Christian authors, is an application of the principle of Casuality (see CAUSE). We cannot conceive an infinite regression of finite causes; therefore beyond the last or first of the finite causes is the Infinite. From motion the argument is to a mover.

(3) The teleological argument, or argument from design, proceeds from the order and arrangement of the universe, the reign of law and beauty and adaptation, to the intelligent and supreme fountain of order. This is the most familiar of the arguments, especially on the lines laid down by Paley.

(4) The moral argument was that relied on by Kant when he destructively criticized the other three, and forms a part of the most modern theistic arguments. God is a postulate of our moral nature; and the moral law in us implies a lawgiver without us.

Theiss, a river of Hungary, formed in the E. of the kingdom by the junction of the Black and the White Theiss, both descending from the Carpathians and flowing into the Danube about 20 miles above Belgrade; length, about 800 miles. It is the second river in Hungary, being inferior only to the Danube, with which, for about 100 miles, the lower part of its course is almost parallel. Its principal tributary is the Maros from the E.

Thelephora, in botany, a genus of *Auricularini,* now limited to fungals, whose hymenium shows slight traces of papillæ or veins, and is confluent with the pileus, which is fibrous and has no cuticle. Found in the tropics of America.

Thelodus, in palæontology, a provisional genus of *Ostracionts,* founded on shagreen scales from the Ludlow bone bed.

Thelphusa, in zoölogy, the type genus of *Thelphusidæ.* Carapace flat, smooth, broad, and heart-shaped; external antennæ very short, placed near footstalks of eyes. *T. fluviatilis,* the best-known species, is from the S. E. of Europe.

Thelphusidæ, in zoölogy, a family of brachyurous *Crustaceæ.* Carapace more or less oval; eye footstalks short, fourth joint of jaw feet not inserted into external angle

of preceding joint. There are three or four genera, and most of the species are tropical or sub-tropical, and live in the earth near the banks of rivers or in humid forests, bearing a strong analogy to land crabs.

Thelygonum, in botany, a genus of *Chenopodiaceæ*. Only known species *T. cynocrambe*, the *kynokrambē* of Dioscorides, is a somewhat acrid plant, abounding in acicular saline crystals, and is slightly purgative. It is sometimes used as a potherb. It is a native of the countries bordering the Mediterranean.

Thelymitra, in botany, the typical genus of *Thelymitridæ*. Orchids with fascicled or tuberous roots, one solitary sheathing leaf, with loose spikes of blue, white, pink, or yellow flowers. Chiefly from Australia and New Zealand.

Thelyphonidea, in zoölogy, an order of the class *Arachnida*. Cephalothorax similar to that of the scorpions, bearing also similar traces of its soldered segments; abdomen segmented, and united to cephalothorax by a pedicle, but never throughout its entire breadth. There are three families, all tropical.

Thelyphonides, the type family of *Thelyphonidea*, with one genus, *Thelyphonus*. The abdomen terminates with three post-abdominal segments, to which is attached a many-jointed setiferous tail.

Thelyphonus, the type genus of *Thelyphonides* with 29 species, confined to the tropical regions of Asia, America, and Australasia. They are nocturnal or crepuscular, living by day in damp places under the bark of old trees; when disturbed they hold up the palpi, as if for defense, and beat a rapid retreat, with the tail erect.

Themis, in Greek mythology, one of the Titanides, the daughter of Uranus and Gē, was after Metis married to Zeus, and bore him the Horæ — Eunomia ("Equity"), Dike ("Justice"), and Eirēne ("Peace"); also the Moirai or Fates. She was regarded as the personification of order and justice, or of whatever is established by use and wont; and as such was charged by Zeus to convoke the gods, and preside over them when assembled, being likewise represented as reigning in the assemblies of men. In art Themis holds a cornucopia and a pair of scales.

Themistocles, an Athenian general and statesman; born about 520 B. C. His father, Neocles, belonged to an undistinguished family of the middle class; his mother was a Carian. Ambitious from his cradle, he used his archonship of 493 for the promotion of his political plans. He saw what was best for Athens when he turned the attention of his countrymen to the sea and convinced them that a powerful fleet was absolutely necessary for their welfare. A large sum of money, the produce of the silver mines of Laurium, which it was proposed to divide among the people, was devoted to its construction. During the war with Persia which followed, Themistocles, commander of the Athenian squadron, which numbered 200 of the 324 vessels engaged, to avoid dissension was content to serve under the Spartan Eurybiadas, a man of narrow mind and hopeless obstinacy. On the eve of Salamis it required all the influence of Themistocles' vehement personality and threats to induce his timid superior and colleagues to await the attack of the enemy. In his eagerness to precipitate a collision, he sent by night a messenger to urge the Persian generals to make an immediate attack, as the Greeks had resolved on retreat. He thus provided for himself, whatever the issue might be.

THEMISTOCLES.

Intimation of the Persian advance was brought at nightfall by his rival Aristides, who had been ostracized in 483 B. C. The Peloponnesians refused to continue the pursuit of the Persians beyond Andros. From that place Themistocles sent a second message to Xerxes urging him to hasten back before the Greeks carried out their project of breaking down the bridges. Though later Themistocles may have found it convenient to interpret this act differently, it was honestly sent at the time with the intention of inducing Xerxes to leave Attica. The victor of Salamis was now the foremost name in the minds and mouths of men. The rebuilding of the walls of Athens by his ad

vice on a scale far larger than anything in existence aroused great uneasiness among the allies of Sparta, but, by a series of adroit stratagems, Themistocles succeeded in cajoling the ephors till the walls had reached a height sufficient for defense. But his popularity was now waning, and the Spartan faction in Athens was plotting his ruin. Plutarch tells us that he provoked the anger and resentment of the citizens by his insufferable arrogance. In 471 B. C. ostracism was demanded, and he was banished from Athens. Argos was his first retreat, but so long as he remained there Sparta could have no security or peace. His condemnation on the false charge of implication in the treason of Pausanias drove him from Argos. He fled to Corcyea, and after a series of hairbreadth escapes was compelled to seek shelter in Asia. Artaxerxes received his suppliant with the greatest favor, and listened with attention to his schemes for the subjugation of Greece. It is said that the young king was so affected with joy that he was heard at night to cry thrice in his dreams, "Themistocles, the Athenian, is mine." After the Persian fashion, the town of Lampsacus was appointed to supply him with wine, Magnesia with bread, and Myus with other provisions. At Magnesia he lived securely till about 453 B. C.

"In a word," says Thucydides, "Themistocles, by natural force of mind, and with the least preparation, was of all men the best able to extemporize the right thing to be done." Of his moral character the great historian says nothing. But if his patriotism seems at times to have been but a larger kind of selfishness, it must be remembered that Themistocles was possessed of the conviction that no one could realize the dream of a great Athenian empire but himself. The sentence passed on him was a bitter return for the unparalleled services he had rendered his country, and, due as it was to Spartan influence and jealousy, proved all the harder for a man of spirit to bear.

Thénard, Louis Jacques, a French chemist; born in La Louptière (Aube) May 4, 1777; studied chemistry in Paris under Bauquelin; was appointed (1810) professor at the Collége de France, and later at the Polytechnic School and in the philosophical faculty of the university; in 1825 was created baron, and in 1852 peer of France. In 1837 he resigned his professorship at the Polytechnic School, and in 1840 that at the university. In 1842, however, he became grand officer of the legion of honor, and in 1850 member of the Council of Public Instruction. His chief work is "Treatise on Elementary Chemistry" (5 vols. Paris 1813–1817; 6th ed. 1833–1836). Along with Gay-Lussac he published in 1816 "Physico-Chemical Researches," and for several years was coeditor of the "Annals of Chemistry" and "Annals of Physics and Chemistry." He died in Paris June 21, 1857.

Theobald, Lewis, an English writer; born in Sittingbourne, England, about 1690; was brought up to the profession of the law, but early turned his attention to literature. Pope was meanly jealous of him, and ridiculed him in his "Dunciad." Theobald, however, had his revenge, his edition of Shakespeare (1733) completely supplanting Pope's. He did great service to literature by this painstaking work, many of his emendations having been adopted by subsequent editors. He died in September, 1744.

Theobromine, $C_7H_8N_4O_2$, a feeble base present in cocoa and chocolate; extracted from cacao beans in much the same way in which caffeine is extracted from coffee. When pure it is a colorless, crystalline powder, sparingly soluble in boiling water, and still less so in alcohol and ether. It gives crystalline salts with certain acids. From theobromide of silver, caffeine may be prepared along with iodide of silver by treatment with iodide of methyl, so that caffeine ($C_7H_7CH_3N_4O_2$) may be regarded as methyl theobromine — a hydrogen molecule being replaced by a methyl molecule.

Theobroma, in botany, a genus of *Byttneræ*. Small trees, with large simple leaves, and the flowers in clusters. Sepals five; petals five, hooded, ligulate at the apex, stamens five, each with double anthers, and a horn-like appendage between the filaments; styles filiform; fruit large, five-celled; stigma five-parted; more or less pentagonal fruits, with a thick tough rind, seeds embedded in pulp; albumen none; cotyledons thick, oily, wrinkled. *T. cacao*, the cacao tree is 16 or 18 feet high, with large, oblong, entire, acuminate, smooth leaves; clusters of flowers, with the calyx rose-colored and the petals yellowish. Fruit 6 to 10 inches long, 3 to 5 broad, with 10 elevated longitudinal ribs. The ripe fruits are yellow. Each contains between 50 and 100 seeds. These, slightly fermented, constitute the cacao. Great forests of the cacao tree exist in Demarara. It is also cultivated extensively in the West Indies, and grows as far N. as Mexico, and has been introduced into India and Ceylon. A concrete oil, obtained by expression and heat from the ground seeds, is used as an emollient. It does not become rancid, and on that account is largely used in pharmacy for the preparation of suppositories and pessaries.

Theobromic Acid, $C_{64}H_{128}O_2$; obtained from cacao butter by saponification, and

fractional distillation of the product. It melts at 72.2°, and distills at a higher temperature without decomposition.

Theobromine, $C_7H_8N_4O_2$; an alkaloid present in the seeds of *Theobroma cacao,* to the extent of from 1 to 2 per cent. It can be obtained by treating a hot-water extract of the ground beans with acetate of lead, removing excess of lead with sulphydric acid, evaporating the solution, and extracting the theobromine with alcohol. It forms short prismatic crystals, having a bitter taste, slightly soluble in water and alcohol. It is neutral, but unites with acids forming crystalline salts. Heated to 100° with methyl iodide it is converted into methyl-theobromine or theine.

Theocracy, that government of which the chief is, or is believed to be, God himself, the priests being the promulgators and expounders of the divine commands. The most notable theocratic government of all times is that established by Moses among the Israelites.

Theocritus, a Greek poet; a native of Syracuse and son of Praxagoras and Philina. Suidas, however, says that some made him the son of Simichus or Simachidas, and that he was a native of Cos and only a *metoikos* at Syracuse. This statement vanishes on investigation. Theocritus seems to have been intimately associated with the poet Aratus, author of the "Phænomena." This is not strange, since the court of the Ptolemies was the mart of intellect then; and it is known that Theocritus at least once in his life visited that great center of poetry and philosophy. More than one of his idylls may have been written there; there can be no doubt left in the mind of a careful reader that he was at Alexandria and enjoyed for a time the friendship and patronage of Ptolemy Philadelphus. His 10th "Idyll" was unquestionably written at Syracuse, after the accession of Hiero (270 B. C.). The inference from all that can be gleaned from the poet himself as to his period, is that he flourished 284–262 B. C. It is impossible to discuss here the question of his intimacy with Philetas, or the influence of the works of that poet on his mind. It is at least certain that Theocritus was in Syracuse during the reign of Hiero II., and it is extremely probable that his 16th "Idyll" was written after that monarch's alliance with the Romans, 263 B. C. Theocritus was far from being satisfied with his treatment at the court of Hiero, or with the state of affairs generally.

THEOCRITUS.

How he spent his later years is wholly unknown, yet we may well suppose that the closing period of his life was devoted to the contemplation and enjoyment of rural life, the praise of which has made his name so famous and won for him the foremost place among bucolic bards. The genuineness of some of the idylls is disputed. This could hardly be otherwise. But the chief glory of Theocritus lies in his being the founder of a fresh and fertile school of poetry. Bion and Moschus, a little later, achieved distinction in the same walk. Vergil drawing from the same sweet well enriched Roman literature with poems of marvelous beauty, however inferior to those of his prototype. Legends that blossomed into birth in the popular myths sung aforetime by Stesichorus and Sophron, assumed under the master hand of Theocritus a freshness which never failed to charm. For his idylls are the very quintessence of natural delights — whispering pines, shepherd loves, and mildly-moaning waves. His idylls might have been written yesterday. In character they are mimetic and dramatic. Yet they are in the strict sense of the term "Eidullia." Innocence, simplicity, fidelity — the characteristics of the early Sicilian race — constitute his objective theme. The "Adoniazusæ," a masterpiece of depiction of female character, is characterized throughout by genuine dramatic force and spirit.

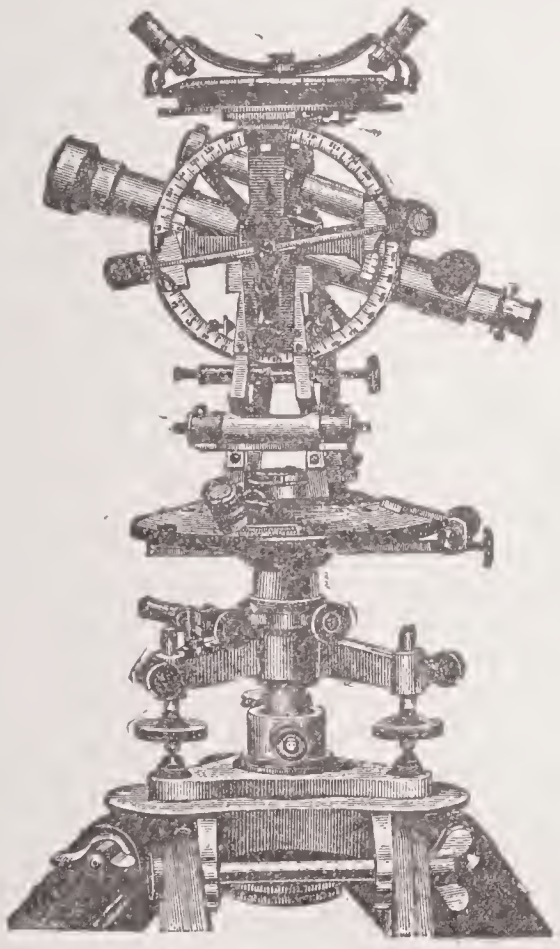
Language and rhythm, symmetry and proportion, with the rare faculty of easy transition, were with him natural gifts. Above all, he had a thorough knowledge of his art and of its limits. Incongruities of style and subject may occasionally be detected in his idylls, but in the writings of what poet is it otherwise? It may be mentioned that the pieces, the genuineness of which is disputed, are the 12th, 17th, 18th, 19th, 20th, 26th, 27th, 29th, 30th. For full information on the integrity of the poems, the reader is referred to the works of Eichstädt (1794); E. Rheinhold (1819); and A. Wissova (1828), with the prefaces of Warton, Meineke, and Wüstemann, in their editions of Theocritus. The *editio princeps* of the idylls without place or date is supposed to have been printed at Venice in 1481. The next is the Aldine (1495). More recent editions are those of Warton (1770); Brunck (1772); Gaisford (1816, 1820–1823); Meineke (1825); Wüstemann (1830); Wordsworth (1844); Paley (1863); and Snow (1869). The edition of H. L. Ahrens (1655–1659) is the most critical and in some respects the best of

all; but the unceremonious way in which he has dealt with the text in poems of acknowledged genuineness is a fatal blot on a work of singular scholarship and ability. Theocritus has been translated into most of the tongues of Europe. Some of the German renderings are exceptionally good. English translations are numerous. Those of Creech, Hoyland, Fawkes, Polwhele, Chapman, and Calverly are the most notable.

Theodicy, in philosophy, a vindication of the Deity in respect of the organization of the world and the freedom of the human will. The term is specially applied to a defense of theism against atheism, which Leibnitz undertook by publishing in 1710, his "Essay on Theodicy," respecting the goodness of God, the liberty of man, and the origin of the Bible. The problem theodicy proposes to solve is stated and estimated by Albert Taylor Bledsoe, as follows:

"How, under the government of an infinitely perfect Being, evil could have proceeded from a creature of his own, has ever been regarded as the great difficulty pertaining to the intellectual system of the universe."

Theodolite, a most important instrument for measuring horizontal and vertical angles, but particularly adapted for accurately measuring the former. Its principle is identical with that of the altitude and azimuth instrument; the construction and purpose of the two, however, differ, the latter being employed for astronomical purposes, while the theodolite is used for land surveying; but the better instruments of this class may be employed for observing the altitude of celestial bodies. The vertical circle is not generally, however, of sufficient size, nor so graduated as to be available for very accurate astronomical observations.



THEODOLITE.

When a point is to be viewed with the telescope, the telescope is moved so that the image of the point coincides with the intersection of the cross wires. The vertical limb is divided into degrees, and is capable of being read by means of the vernier and the microscope to thirds of a minute. A pair of plates, constituting at their edge the horizontal limb of the instrument, are free, when unclamped, to move independently of each other. The plate carries a magnetic compass and two spirit levels at right angles to each other, by means of which the circle may be brought accurately into the horizontal plane by raising or depressing it by means of the screws. The plate is furnished with two verniers, diametrically opposite to each other, the degrees marked on which are read off by the microscope. By the motion of the telescope, on the horizontal axis of the vertical limb, altitudes and vertical angles can be measured, while, by its motion on the vertical axis, the angular distances between two objects can be ascertained by the readings on the horizontal circle.

Before using a theodolite, it should be properly adjusted; that is, the different parts should be brought to their proper relative positions. The theodolite is in adjustment when the following conditions are fulfilled: (1) When the intersection of the cross wires is in the axis of the telescope. (2) When the axis of the attached level is parallel to the axis of the telescope. (3) When the axes of the levels on the horizontal limb are perpendicular to the axis of the horizontal limb. (4) When the axis of the vertical limb is perpendicular to the axis of the horizontal limb.

Theodora, the famous consort of the Byzantine emperor, Justinian I.; was, according to the dubious evidence of Procopius, the daughter of Acacius, a bear-ward at Constantinople; and had already been by turns actress, dancer, and harlot, when she won the heart of the austere and ambitious Justinian, to become in succession his mistress, his wife, and the sharer of his throne (527). There was a law which forbade a member of the senate to marry an actress, but Justinian cleared the way by repealing it. Theodora was of less than middle height, and her complexion was pale, but such was her beauty that Procopius tells us "it was impossible for mere man to describe her comeliness in words, or imitate it in art." Never thereafter did the breath of scandal touch her name; she became Justinian's trustiest counsellor, bore a chief share in the work of government, and saved the throne by her high courage at the crisis of the Nika riots (532). "Now every man

must die once," said she in council, "and for a king death is better than dethronement and exile. . . . If you wish, O emperor, to save your life, nothing is easier; there are your ships and the sea. But I agree with the old saying that 'empire is the best winding sheet.'" She lavished her bounty on the poor, and especially on the unfortunate of her own sex, and died at 40 (548), her slender and graceful frame worn out by the anxieties of State. Her character descended to history unspotted till the appearance (1623) of the "Secret History" of Procopius, the work of a man who had enjoyed the full favor and confidence of the court, and had in his other writings openly extolled the triumphs and the wisdom of Justinian and Theodora, whose reputation he was the while laboring in secret to destroy. His stories satisfied his first editor, Nicholas Alemannus, and later Gibbon and Dahn; but it may be remembered that there is not a word of Theodora's profligacy in "Evagrius" or "Zonaras," and moreover that, when a man owns that elsewhere he has purposely denied or concealed the truth, it may at least be said that we are entitled to hesitate about the value of his testimony at all.

Theodore of Mopsuestia, an exegete of the early Church; born in Antioch about the middle of the 4th century. He was the friend of Chrysostom and the pupil of Libanius, but it was Diodorus of Tarsus from whom he imbibed his zeal for Biblical studies. About the year 383 he became a presbyter in Antioch, and about 392 he was chosen Bishop of Mopsuestia in Cilicia. Theodore wrote commentaries on almost all the books of Scripture, of which only remain, in the Greek, that on the Minor Prophets; in Latin translations, those on the lesser epistles of Paul, besides many fragments, especially on the epistle to the Romans. As an exegetic he eschews the allegorical method, adopting the literal meaning, and he takes into consideration also the historical circumstances of the composition, and assumes varying degrees of inspiration. When the Nestorian controversy broke out his polemical writings, which seem to have offended by a characteristically sober tone, were attacked, and after a century of fanatical agitation were formally condemned by Justinian in the "Tria Capitula" (544). The fifth œcumenical council — that of Constantinople in 553 — confirmed the emperor's condemnation, and Theodore's name vanished from the list of orthodox writers. He died at peace with all men in 428 or 429.

Theodore, "King of Corsica," otherwise Baron Theodore de Neuhoff, son of a Westphalian noble in the French service; born in Metz in 1686; was successively in the French, Swedish, and Spanish service; was ruined in Law's speculations (see Law, John); and after leading an adventurer's life settled at Florence in 1732. As a representative of the Emperor Charles VI., he was induced by Corsican acquaintances to head a Corsican rising against the Genoese; and with the support of Turkey and a ship and munitions from the Bey of Tunis landed in Corsica in March, 1736, and was crowned Theodore I. He was in a few months driven to flight, as he was again on a second attempt in 1738, and on a third in 1743. After many wanderings he settled in London in 1749. Imprisoned by his creditors, he was liberated by a subscription supported by Walpole, but died soon after, Dec. 11, 1756. In Spain he had married an Irish lady, daughter of the Earl of Kilmallock. His only son by her, known as Colonel Frederick, wrote a book on "Corsica," and at the age of about 72 shot himself in the porch of Westminster Abbey, Feb. 1, 1797.

Theodore II., King of Abyssinia; born in the province of Kwara in 1818; for many years a rebel; finally fought his way to the throne in 1855. He was a man of great parts, an inveterate foe of Islamism, a born ruler, and an intelligent reformer. But intolerance of any power save his own finally made a tyrant of him; and in consequence of the imprisonment of Consul Cameron and other British subjects he brought on himself a war with England, which ended, April 13, 1868, in the storming of Magdala and the death (supposedly by suicide) of Theodore. See Abyssinia.

Theodoret, a Church historian; born in Antioch about 390; early entered a monastery; and in 423 became Bishop of Cyrus, a city of Syria. Here he labored with the utmost zeal, and he himself claims to have converted over 1,000 Marcionites. As a foremost representative of the school of Antioch he became deeply involved in the great Nestorian and Eutychian controversies, and was finally deposed by the celebrated Robber Council of Ephesus in 449. This was reversed by the general council of Chalcedon in 451, but Theodoret did not long survive his restoration, dying about 457. His works were edited by Schulze and Nösselt (1769–1774), and consist of commentaries on Canticles the Prophets, Psalms, and the whole of St. Paul's Epistles; a "History of the Church," from A. D. 325 to 429, in five books, (ed. by T. Gaisford, 1854); "Religious History," being the lives of the so-called Fathers of the Desert, a series of most curious and interesting pictures of early ascetic life; the "Eranistes," a dialogue against Eutychianism; "A Concise History of Heresies," together with orations and nearly 200 letters.

Theodoric, King of the Ostrogoths; born in Pannonia in 455; son of Theodemir, King

of the Ostrogoths of Pannonia. From his eighth to his 18th year he lived as a hostage with the Emperor Leo at Constantinople. Two years after his return he succeeded to the throne. In 493 after several bloody engagements, Theodoric induced Odoacer, who had assumed the title of King of Italy, to grant him equal authority. The murder of Oodacer at a banquet soon after opened the way for Theodoric to have himself proclaimed sole ruler. Theodoric ruled with great vigor and ability. He attached his soldiers by assigning them a third part of the lands of Italy, on the tenure of military service; while among his Italian subjects, whom he concilated by introducing an improved administration of justice, he encouraged industry and the arts of peace. Though, like his ancestors, he was an Arian, he never violated the peace or privileges of the Catholic Church. He died in Ravenna, Italy, Aug. 30, 526.

Theodoric I., King of the Visigoths, succeeded Wallia in 420. During the interval 426–436, he made war on the Romans three times, and attempted to take the city of Narbonne. He obtained territory both in Spain and Gaul, and subsequently became the ally of the Romans against Attila, whom he defeated at Châlons-sur-Marne in 451, but lost his life in the battle. His son Thorismund succeeded him.

Theodoric II., son of Theodoric I., acquired the throne by the murder of his brother Thorismund in 452, but was himself killed by Euric, another of the sons of Theodoric I. During his short reign he increased the empire of the Visigoths, and advanced almost as far as the Loire. He was killed in 466.

Theodorus, a bishop and exegete; belonged to a wealthy family of Antioch, where he was born in the first half of the 4th century. In 393 he was made Bishop of Mopsuestia in Cilicia, and is thought to have died in the year 429. He was the most eminent exegetical writer of the Syrian school of his time. Like his contemporaries, Jerome and Chrysostom, he held a liberal view of the inspiration of the Scriptures, and applied the grammatico-logical method to its interpretation, as opposed to the allegorical method of Origen. In theology he contended against the current of popular opinion of the time on several points. (1) He denied that the Spirit owed his existence to the Son. (2) He was the Father of the Nestorians in making a clear distinction between the divine and the human nature in the person of Christ, holding that the latter was developed into the former by a gradual process. His writings, most of which are lost, were anathematized after his death in an edict of Justinian (544), called "of the three chapters" (*i. e.*, articles).

Theodorus I., Pope, succeeded John IV. in 642. He excommunicated Paulus, patriarch of Constantinople, and condemned the heresy of the Monothelites. His successor was Martin I. He died in 649.

Theodorus II., succeeded John IX. in 897, but died in less than a month after his election.

Theodosia. See KAFFA.

Theodosius the Elder, a Spaniard by birth and a skillful Roman general; was sent to Britain in A. D. 367 to repel the inroads of the Caledonians and restore order to the diocese. He made London his headquarters, and was so successful in his undertakings that he formed the country between Hadrian's Wall and the Forth and Clyde into a new province of the empire, called Valentia in honor of the reigning emperors. After a victorious campaign on the Upper Danube against the Alemanni he quelled a formidable revolt in Africa under Firmus the Moor, and was executed at Carthage in 376 on some unknown and probably groundless charge.

Theodosius I., the Great, son of Theodosius the Elder; one of the most notable and most capable of the later Roman emperors; born in Cauca, Spain, about 346; served under his father in Britain, Germany, and Africa, and won fame as a general by his exploits in Mœsia. On his father's death he retired to his native farm, whence he was summoned by Gratian to become his colleague in the purple and emperor in the East (379). It was a critical time. The Goths, too numerous and formidable to be attacked *en masse*, flushed, too, with their recent Cannæ-like victory at Adrianople and the total defeat of his predecessor Valens, were roaming the country at will, unchecked masters of the situation. His military reputation was equal to the strain. He made Thessalonica his headquarters, and within four years, through patience and tact, after reviving the spirits of the imperial troops by small but decisive victories, he broke up the vast Gothic army, attached many of its members to the empire as faithful soldiers and allies under their own chiefs, and restored tranquillity to the troubled country S. of the Danube.

A serious illness in 380 led to his baptism as a Trinitarian, and, as a consequence, to the restoration of the religious unity of the empire and the promulgation of various edicts against Arianism and other heresies. He appointed Gregory Nazianzen Archbishop of Constantinople, and summoned the second general council, which met there (381) to supplement the labors of Nicæa. The murder of Gratian at Lyons, the advance toward Italy of the upstart Maximus, proclaimed emperor in Britain, and the arrival of Valentinian II. (with his mother Justina and his sister Galla) begging for

help led to Theodosius' marriage with Galla, to his victory at Aquileia (388), and to the restoration of his youthful colleague. Hereafter for some years Theodosius lived at Milan enjoying the friendship and respect of its bishop, St. Ambrose. The relationship of those two great men — foremost respectively in State and Church — honorable to both and dramatic in its climax, is one of the most interesting features of Theodosius' reign.

Theodosius was able, just, even generous, virtuous, and religious, but inclined to indolence and of a passionate temper. He had canceled, on the entreaties of its bishop and the penitence and humiliation of its leading citizens, the severe measures meted out to Antioch after a riot (387) in which the imperial statues had been contemptuously overthrown; but in 390, when the governor of Thessalonica was lynched by a circus mob for his punishment of a brutal but favorite charioteer, Theodosius, in spite of expostulations, ordered the people of the city to be invited into the circus and there massacred. At least 7,000 were thus put to death. Thereupon Ambrose wrote to Theodosius upbraiding him with the deed, and even after some time had elapsed fearlessly withstood his attempt to enter the church at Milan. The bishop only readmitted the emperor to the sacrament after eight months' retirement and public penance performed in the face of the whole congregation. In 392 Valentinian II. was murdered, and in 394 Theodosius, then at Constantinople, again marched W., this time against the Frankish general Arbogast and his puppet, Emperor Eugenius. After a stubborn fight at the Frigidus river, lasting two days, Theodosius gained a complete victory, and for four months ruled as sole Roman emperor. He expired in the arms of Ambrose on Jan. 17, 395 — a date memorable in the history of the later Roman empire, for almost immediately thereafter followed the barbarian invasions of Greece and Italy, which led directly to the subsequent Teutonic settlements in the S. and indirectly to the formation of the kingdoms of modern Europe.

Theodosius II., son of Arcadius, and grandson of Theodosius I.; succeeded his father in 408, in the Empire of the East. The government was carried on, during the greater part of his reign, by his sister Pulcheria. In his reign was compiled and published the celebrated code of laws, styled after him the "Theodosian Code." He died in 450.

Theodosius III., Emperor of Constantinople; nominated in succession to Anastasius II., 716. After a reign of two years he abdicated in favor of Leo III.

Theological Schools. According to the report of the United States Commissioner of Education for the school year ending in 1909, there were 162 schools of the different denominations, with 1,350 instructors and 10,218 students. These institutions had grounds and buildings valued at $19,766,100; endowment funds aggregating $32,024,000; benefactions of the year, $1,183,500; volumes in the libraries, 2,080,000; and total income, $3,119,300. The following table gives such schools by denominations:

Denominations.	Schools.	Students.	Value of grounds and buildings.	Endowment funds.	Volumes in libraries.
Catholic	28	1,994	$2,755,816	$801,750	250,547
Presbyterian	29	1,443	3,612,283	6,811,802	423,680
Northern	13	889	2,671,283	4,974,172	279,076
Southern	5	191	296,000	625,000	51,000
United Presbyterian	2	104	130,000	415,000	10,508
Associate Reformed	1	7	0	35,000	2,000
Cumberland	1	54	30,000	82,000	5,000
Reformed (Allegheny, Pa.)	1	20	25,000	75,630	3,500
Reformed Church in United States	4	118	100,000	195,000	22,500
Reformed Church in America	2	60	300,000	410,000	50,096
Baptist	14	1,186	1,461,821	2,556,524	138,608
Methodist	25	1,133	1,605,000	1,228,800	98,825
Methodist Episcopal	19	970	1,545,000	1,159,800	90,625
Methodist Protestant	3	74	10,000	4,000	3,000
African Methodist Episcopal	1	35	12,000	.....	2,200
Free Methodist	1	9	.....	.....	.....
United Brethren	1	45	38,000	65,000	3,000
Lutheran	23	984	1,419,500	572,638	79,609
Congregational	12	490	1,446,000	3,372,909	175,080
Protestant Episcopal	13	409	2,392,877	2,877,090	132,744
Disciples	5	231	15,000	77,675	1,682
Christian	2	31	27,000	57,990	2,684
Jewish	2	113	48,000	51,098	16,789
Universalist	3	49	50,000	355,000	18,500
Evangelical Association	1	40	.....	22,000	.....
Unitarian	1	26	50,700	360,000	28,000
Moravian	1	11	100,000	115,633	1,500
Swedenborgian	1	8	60,000	124,157	2,000
Non-sectarian	3	113	.....	45,000	30,410

The number of graduates of all schools in 1909 was 1775.

Theology, a term applied by the classic authors to treatises on the nature and worship of the gods, such as the "Works and Days" of Hesiod, and the "On the Nature of the Gods" of Cicero. Augustine quotes Eusebius and Varro as dividing theology into three kinds: the fabulous, that of the poets; the natural, that of the philosophers; and the political, that of the priests and the common people. The first and second kinds could be changed according to the will of the investigators; but the last could not be altered without national consent.

In Christianity, theology is the science which treats of divine things, especially of the relations of man to God. Doctrinal formulas are recognized in Scripture, which uses such expressions as "the mysteries of God" (I Cor. iv: 1), "the form of sound words" (II Tim. i: 13), "sound doctrine" (Titus i: 9); but the term theology does not occur, though the elements of which it is compounded are found in close connection. Theology is primarily divided into natural and supernatural, or revealed; the former deduced by reason from a survey of the universe, the latter founded on revelation. Natural religion is recognized in Scripture (Ps. xix: 1–6, Rom. i: 19, 20), and is held to establish the being, power, wisdom, and goodness of God, the obligation of His moral law and the folly and danger of transgressing it, and the immortality of the soul. Revealed religion is considered to superadd to these doctrines those of the Trinity, the creation and fall of man, the penalty of sin, the mission, work, and atoning death of Christ, His resurrection, ascension, and second advent, with many other doctrines. Before a theology embracing the teaching of the Bible on these subjects can be constructed, the following sciences are required: Biblical criticism, to ascertain the exact text of certain works claiming to be inspired, and, if possible, their time, place, and human authorship; apologetics, to establish and defend their claim to inspiration; hermeneutics, to investigate the principles of interpretation; exegesis, to carry those principles into practice by actual interpretation. Dogmatic theology follows; its province being to bring together and classify the doctrines scattered through the Bible; polemic theology defends these against adversaries; practical theology reduces them to practice, and pastoral theology investigates the most approved methods of presenting them to the people.

Throughout Scripture there is a well-marked development or evolution of doctrine from the earliest period to the close of New Testament times. The New Testament theology constitutes the chief basis of the theologies of all churches. It was followed by that of the Apostolic Fathers, and then by that of the Fathers in general. It varied according to the idiosyncrasy of the several writers. Most doctrines were stated at first in general terms, they were then expounded and discussed by theologians, and when necessity arose, decision of council gave them a clear and concise form. In mediæval times great efforts were made to state theological doctrines in language derived from the metaphysics of the age, and show their harmony; the result was the Scholastic theology. The application of the commandants of the moral law to individual conduct gave rise to moral theology. The Protestant theology, which commenced with Luther and Zwingle, was professedly founded on Scripture, interpreted by private judgment, the right of exercising which was boldly asserted; that of the Roman Catholics was founded on the consensus of the Fathers, the decisions of councils, and of the Holy See, and not on the results of individual investigation. Fearless and resolute exercise of private judgment in Germany, Holland, the Protestant cantons of Switzerland, etc., has resulted in rationalism, which has also arisen in most continental countries in union with Rome, by a reaction against authority. In the Methodist, Baptist, Reformed Episcopal, Presbyterian and English dissenting churches evangelical theology is generally accepted, though here and there more or less latent rationalism prevails. In the Anglican church there is a contest going on between the Calvinistic and Roman theology with the large influence of tractarianism in favor of the latter.

Theophany, specially the appearance of God to the patriarchs in the form of an angel or in human form; also the incarnation and second coming of Christ.

Theophilanthropy, in comparative religions, the name given to a system of natural religion which arose in the time of the first French Republic, and which had for its cardinal doctrines the adoration of God and love of man. In 1796 five heads of families — Chemin, Mareau, Janes, Haüy, and Maudar — associated themselves, and in December held their first meeting at a house in the Rue St. Denis for the purpose of divine worship and moral instruction, according to the dictates of natural religion. Their services consisted of moral discourses, singing, and prayer. One of their adherents was Revellière-Lépaux, a member of the Directory, who allowed them the use of the 10 parish churches of Paris, which they fitted up and adorned with religious and moral inscriptions, an ancient altar, a basket of flowers as an offering to the Supreme Being, a pulpit, and allegorical paintings and banners. In 1802 Napoleon I. forbade them to hold their meetings in the churches, and

after this time they no longer appear as a body.

Theophilus, a legendary coadjutor-bishop at Adana in Cilicia, who, when deposed from his office through slanders, gave his soul in bond to the devil, and consequently was reinstated the next morning. But he was soon overtaken with remorse, and through 40 days' fasting and prayers prevailed on the Virgin to make intercession for him. She tore the bond from the devil, and laid it upon the breast of the repentant sinner as he lay asleep in the church. Theophilus then made a public confession of his crime and of the mercy of the Virgin, and died three days after. This forerunner of the Faust legend must have reached the West during the 10th century.

Theophrasta (named after Theophrastus, the philosopher), the typical genus of *Theophrasteæ*. Only known species, *T. jussieui*. It is a small tree with an unbranched stem, and a tuft of long, evergreen leaves at the top, giving it a superficial resemblance to a palm tree. Calyx and corolla campanulate, the former cartilaginous, the latter with a short tube, having a dilated throat with an angularly-lobed, fleshy ring, and a spreading limb; stamens five. Fruit, a spherical berry with the seeds half immersed in the placenta. *T. jussieui* is a native of San Domingo and is cultivated for its fine leaves.

Theophrastus, a Greek philosopher; often called the "father of botany"; a native of Eresus, in Lesbos; flourished in the 4th century B. C. He became a pupil of Plato at Athens, and made, at the academy, the acquaintance of Aristotle; but he quitted the academy after Plato's death, and was absent from Athens for some years. On his return, he gladly studied philosophy under his friend Aristotle, who had so high a regard for him as to bequeath to him his library, and to name him his successor. Theophrastus had extraordinary success as head of the Lyceum, and was attended, it is said, by 2,000 disciples. Among them were Demetrius, Phalereus, and Menander. A charge of impiety was brought against him, but he successfully defended himself, and generously interposed to save his adversary from the popular vengeance. He was, however, compelled to leave Athens in 305 B. C., under the law which banished all philosophers. The law was soon repealed and he returned to his post and peacefully taught and commented on the system of his master, Aristotle, till his death. His writings were very numerous, but have perished with the following exceptions: His work entitled "Characters," a set of his lively sketches of vicious or ridiculous characters; treatises on the "History of Plants," on the "Causes of Plants," and on "Stones"; a work on the "Senses," and several fragments. The "Characters" served as the model for La Bruyère's work with the same title; it has been several times translated into English, French, and German.

Theophylactus, surnamed SIMOCATTA (thē-ō-fil-ak'tus), a Byzantine historian; born in Locri about 570. Three of his works are extant: "History of the Emperor Maurice"; "Problems of Physics"; "Letters, Moral, Rural, and Amorous,"—of these there are 85, in which are imitated the letters of Aristænetus. He died in Locri about 629.

Theopompus of Chios, a Greek historian; born about 378 B. C. His principal historical works were "The Hellenics," in 12 books, and "The Philippics," in 58 books; the former being a continuation of Thucydides, and the latter a general history of his own times, with the reign of Philip of Macedon as central point.

Theorbo, in music, an old stringed instrument resembling the lute in form or tone. It had two necks, to the longest of which the bass strings were attached. It was employed for accompanying voices, and was in great favor during the 17th century. It differed from the lute in the possession of its two necks, whence it is sometimes called cithara bijuga. The strings were usually single in the theorbo, and when double, or tuned in octaves or in unison with the bass or treble notes, the instrument was called the arch lute or chittarone.

Theorem, in geometry, a proposition to be proved; a statement of a principle to be demonstrated; that is, the truth of which is required to be made evident by a course of reasoning called a demonstration. In the synthetical method of investigation, which is that for the most part employed in geometry, it is usual to state the principle to be proved before commencing the demonstration, which proceeds by a regular course of argumentation to the final conclusion, confirmatory of the principle enunciated. The principle being proved, it may properly be employed as a premiss in the deduction of new truths. The principle, as enunciated before the demonstration, is the theorem; its statement after demonstration constitutes a rule or formula, according as the statement is made in ordinary or in algebraic language. A theorem differs from a problem in this, that the latter is a statement of something to be done, the former of something to be proved.

Theoria Motus, or **Theoria Motus Corporum Cœlestium,** the names by which is usually quoted the work of Gauss, in which he first showed the method of computing an orbit from three determinations of a planet's or comet's position, and thus

rescued astronomers from the danger of losing the newly discovered asteroid Ceres after it had disappeared in the region of the sun. The full title of the work is "Theoria Motus Corporum Cœlestium in Sectionibus Conicis Solum Ambientium." It was first published at Hamburg in 1809. An English translation by Rear-Admiral C. H. Davis, U. S. N., then Superintendent of the Nautical Almanac Office, was published in Boston in 1857, at the joint expense of the "Nautical Almanac" Office and the Smithsonian Institution. A French translation by Dubois was published at Paris in 1864, and a German one by Hasse at Hanover in 1865. The work also contains an exposition of the theory of the method of Least Squares, and is one of the most important astronomical works extant.

Theosophy, a name which since the time of Ammonius Saccas, in the 3d century after Christ, has been used in the West to cover various schools of religious philosophy, which all unite in the fundamental conception that man, in his innermost nature, is a spiritual being, one in his essence with the Universal Spirit manifested in and through the universe. In this general sense it includes mystics differing from one another in details. Among these are the Simonian, Ophite, and Valentinian schools of so-called Gnosticism; the Neoplatonist of Ammonius Saccas, Porphyry, Plotinus, Iamblichus, and Longinus; the great Hermetic and Rosicrucian orders, which kept an unbroken tradition through mediæval and modern Europe; together with the teachings of men like Jakob Boehme, Henry Vaughan, and Law. These represent the Occidental stream of theosophical thought which has acquired a Christian tone in its symbolism, whereas the Oriental has utilized the symbolism of the great Eastern religions. In the East the system now called Theosophy has been known for ages under the titles of Âtma Vidyâ ("spirit science"), Brahma Vidyâ ("science of Brahma"), Gupta Vidyâ ("secret science"), and other similar names. All alike in East and West, draw their inspiration and their methods from the "Wisdom Religion," the ancient esotoric philosophy. This claims among its initiates the men who have given to the world fragments of the teaching as basis for world-religions, men like Buddha, Confucius, Zarathustra, Phythagoras, Plato, Jesus, and more ancient sages such as Manu, Nârada, and other great Rishis. In the 16th century Paracelsus and Giordano Bruno are among its grandest exponents, and in our own day its messenger was a woman of Russian birth, Helena Petrovna Blavatsky (1831–1891), who was initiated in Tibet, and whose works form the most complete exposition of the esoteric philosophy.

The Esoteric Philosophy, or Wisdom Religion, is a body of teaching, philosophical, scientific, and religious, which is believed to be preserved from generation to generation by a brotherhood of initiates scattered over the world, but preserving close and intimate relations with one another. To a group of these now stationed in Tibet the founding of the Theosophical Society in 1878 is ascribed, and they are constantly referred to in theosophical literature as Mahâtmas, Arhats, Masters, Brothers, or Adepts. They are men who have evolved the spiritual nature till the physical body and brain consciousness have become ductile instruments for the spiritual intelligence. By virtue of this evolution they are said to have gained control over natural forces which enables them to bring about results that appear to be miraculous.

This philosophy teaches as basic principles an eternal existence beyond human cognition, existence *per se*, absoluteness or "beness." A periodical aspect of this is life, consciousness, manifesting itself in and as the universe, primarily emanating as the dual root substance, matter on its negative, and spirit, or energy, on its positive side. This duality is the note of the manifested universe, manifestation being held to be impossible without the "pairs of opposites," positive-negative, active-passive, light-darkness, and the like, ultimating at one part of the chain of evolution in sex difference, male-female. Spirit and matter are therefore not separable, but are merely the opposed poles of the one root substance, and are present in every particle, as the poles in each fragment of a broken magnet. Evolution consists in the gradual densifying of the root substance through seven stages or planes of differentiated existence, the matter aspect becoming more and more prominent as the evolution proceeds, and the spirit aspect becoming more and more hidden; thus matter reaches its fullest differentiation, evolving the whole of its capacities as a vehicle. From this point of completest materiality begins the running curve, during which matter becomes translucent to spirit, and spirit becomes self-conscious on all planes. It manifests itself as brain intellect on the most material plane, and recovers all its super-intellectual powers on the ascending arc, but always with the addition of self-consciousness and individuality, till, at the completion of the cycle, matter has become a perfect objective presentment of spirit, a perfect vehicle of spiritual activity.

The seven stages of cosmical evolution, aspects of the universal Divine consciousness, correspond with seven stages of human evolution, aspects of the human consciousness, by each of which man can cognize directly the corresponding cosmic state.

Theosophy

These in man are distinguished as: (1) Âtmâ, pure spirit, one with the universal spirit. (2) Buddhi, the vehicle of Âtmâ and inseparable from it, sometimes spoken of as the spiritual soul. (3) Manas, the mind, the ego or individualizing principle, called the rational or human soul. These three are the immortal part of man, Manas striving for union with Buddhi, such union making the spiritual ego, the spiritual man perfected. The remaining principles form the quaternay, the perishable part of man. These are: (4) Kâma, the emotions, passions, and appetites. (5) Prâna, the vitality. (6) Linga Sharîra, the astral double. (7) Sthûla Sharîra, the physical body. (These principles are generally numbered in reversed order, starting from the physical, Sthûla Sharîra being taken as 1 and Âtmâ as 7.) At death, it is taught, the physical body and the astral double disintegrate together; the vitality returns to the universal life; the passional nature, in its own ethereal envelope, exists for a longer or shorter period, according as it dominated, or was subservient to, the higher nature, but ultimately fades away. The higher triad has, during earth life, been joined to the lower nature of Manas, the mind; this Manas is divided into higher and lower, the higher striving upward, the lower entangled with Kâma, and held by the desire for material life which is at the root of all manifestation. At death the higher triad gradually separates itself from the lower nature, the lower mind which is but a ray of the higher returning to its source, carrying with it the experiences gained during incarnation; the triad, with this added experience, the harvest of life, enters on a period of repose, the state of Devachan, a state of consciousness apart from the physical body, in which the intelligence is free from physical limitations. Devachan is a state of consciousness in which the experiences of the lately concluded earth life are assimilated, its best aspirations have their fruition, and the communion of the consciousness with other consciousnesses is freed from physical limitations, and is more complete and satisfying. This stage endures for a period proportionate to the stage of evolution reached on earth, and is concluded by the reëntry of the consciousness into the embodied condition.

The method of evolution, according to theosophy, is through reincarnation. The reincarnating ego, the agent in progress, is the Manas. In the past, when physical evolution, guided by the indwelling spirit, had produced man's physical form, Manas first became incarnate therein, and has since reincarnated after each devachanic interlude. Throughout each incarnation it labors to evolve in the body it inhabits the capacity to respond to its impulses, but it is through the molding of successive bodies that it accomplishes its task of human elevation. The thoughts produced by its activity are real things on the mental plane, made of subtle matter, "thought stuff," a form of ether. The thoughts of each life ultimate in a thought body, that expresses the result of that incarnation, and this thought body serves as a mold into which is built the physical body which forms the next dwelling to the ego. The "innate character" which the child brings into the world is the result of its own past, and is physically expressed in its brain and nervous organization. The reincarnating ego is drawn by affinity to the nation and family fitted to supply the most suitable physical, material, and physical environment. The physical particles thence supplied are stamped with the racial and family characteristics, bodily and mental, but this arrangement is dominated by the thought body resulting as above stated. Mental and moral capacities gained by struggle in one or many incarnations become innate qualities, exercised "naturally," without effort, in a later incarnation, and thus progress is secured. This law, by which all causes work out their due effects, is called Karma (the Sanskrit word for action), and according to this all thoughts, good and bad, leave their traces on the thought body and reappear as tendencies in future lives. No escape from this sequence of cause and effect is possible; all our past must work itself out, but as the same agent that made the past is making the present it sets up fresh causes in meeting, the effects of the past. Thus a trouble generated by past action is inevitable; it is in our Karma. But met badly, it sets up fresh cause for bad Karma in the future; or met well it generates good Karma. We made our present destiny in our past, and we are making our future destiny in our present. Reincarnation crushes out all differences of race, sex, class; Karma so interweaves human lives that each can only find happiness and perfection as all find it. It is claimed by theosophy that these facts in nature yield a scientific basis for ethics, and make the practical recognition of human brotherhood a necessary condition of accelerated evolution.

The chief agent in founding the Theosophical Society was Madame H. P. Blavatsky, who, with Col. H. E. Olcott, W. O. Judge, and others, established it in New York in 1875. In 1879 the headquarters were transferred to Madras. In 1887 Madame Blavatsky visited London, from which epoch dates the great literary activity that has recently characterized it. There are now over 300 branches in Europe, India, America, and the colonies, and a large literature. The society has three declared objects, viz.: (1) To form a nucleus of the

universal brotherhood of humanity, without distinction of race, creed, sex, caste, or color. (2) To encourage the study of comparative religion, philosophy, and science. (3) To investigate unexplained laws of nature, and the powers latent in man. The society is unsectarian. No articles of faith need be subscribed to by an adherent, the only condition of membership being an assent to the first object. No dogmas are forced on members, as is the case with religions, and the teachings which are promulgated are merely propositions which can be verified by the student in the course of his progress in the study of occultism. Any individual member has a right to make any declaration of personal belief he pleases, on the understanding that the Society is not implicated.

Thera, an island in the Grecian archipelago, the most S. of the Cyclades; 41 square miles. It possesses extraordinary geological interest on account of the volcanic transformations of which it has been the theater. The whole island is simply one side of a vast crater, the other side of which has sunk into the sea. From the site of the ancient center of volcanic energy small islands have at different times been raised, the last in 1866. Many volcanic convulsions have been witnessed and recorded in Thera during historic time; *e. g.,* 198 B. C., A. D. 1573, A. D. 1710, besides the occurrences of 1866, when two small islands emerged. The soil is exceedingly fertile.

Therapeutæ, an ascetic sect, supposed to live chiefly on Lake Mareotis, near Alexandria. Their discipline resembled that of the Essenes, but was more severe in food and in the preference for the solitary life to the common fellowship. Throughout the week each lived in his lonely dwelling, but on the Sabbath they assembled for worship. The sole authority for their existence, "The Contemplative Life," is not now attributed to Philo, though Edersheim defended his authorship with vigor and ability. It is rather believed to be the work of an early Christian, written about A. D. 300 — an imaginative idealization of the life of Christian monasticism and asceticism of the time.

Therapeutics, the science which treats of the healing of diseases. It deals with the form, manner, and time in which drugs should be administered, if needful to administer them at all; it instructs how to avoid incompatible combinations, and classifies remedial agents. Therapeutics also investigates the laws of health, and how it can be preserved. Another branch of it is dietetics.

Therapon, in ichthyology, a genus of *Percidæ,* with about 20 species, some of which are more or less marine, spread over the Indo-Pacific. Body oblong, compressed, with scales of moderate size; teeth villiform; branchiostegals six. They are all of small size, and may be readily recognized by the blackish longitudinal bands with which the body is ornamented.

Theresa, St. See Teresa, St.

Theriaca, originally a compound prepared by Andromachus of Crete, physician to the Emperor Nero, which continued in high repute till recent times. In Venice, Holland, France, and other places it had to be prepared with certain solemnities in the presence of the magistrates. It received its name from the belief that it was an antidote to the poison of venomous creatures. The word treacle is a corruption of theriaca, and was first applied to a syrup, medicine, or electuary, and then, from similarity of appearance, to the uncrystallized residue obtained in the preparation of sugar, and known as molasses.

Theridiidæ, in zoölogy, a very extensive family of *Dipneumonœ.* Small or moderate-sized spiders, with the abdomen generally large, as compared with the cephalothorax, and broadly ovate. Fore legs usually the longest; eyes in two transverse rows. These spiders are found among foliage, and sometimes construct irregular webs. The species are most numerous in temperate climates, and the greater number belong to the Eastern Hemisphere.

Theriodontia, in palæontology, an order of *Reptilia,* founded by Owen for the reception of a number of remains from deposits in South Africa of Triassic or Permian age. The dentition is of the carnivorous type, consisting of incisors, canines, and molars.

Theriomorpha, in zoölogy, Owen's name for the tailless amphibians (frogs and toads), more generally called *Anoura,* or *Batrachia Salientia.* It is a synonym of Huxley's *Batrachia,* a name used by Owen to designate the class *Amphibia.*

Thermæ. In the Roman thermæ, the baths were of secondary importance. They were a Roman adaptation of the Greek gymnasium, contained exedræ for the philosophers and rhetoricians to lecture in, porticoes for the idle, and libraries for the learned, and were adorned with marbles, fountains, and shaded walks and plantations.

Thermæ Himerenses. See Termini.

Thermic Fever. See Sunstroke.

Thermidor, *i. e.,* the "Hot Month," formed, in the calendar of the first French Republic, the 11th month, and lasted from July 19 to Aug. 18. The 9th Thermidor of the Republican year 2 (July 27, 1794) is historically memorable as the date of Robespierre's fall, and the termination of

the Reign of Terror. The name Thermidorians was given to all those who took part in this fortunate coup d'état, but more particularly to those who were desirous of restoring the monarchy.

Thermo Barometer, an instrument for measuring altitudes by means of determining the boiling point of water. They consist essentially of a small metallic vessel for boiling water, fitted with very delicate thermometers, which are only graduated from 80° to 100°; so that each degree occupying a considerable space on the scale, the tenths, and even the hundredths of a degree, may be estimated, and thus it is possible to determine the height of a place by means of the boiling point to within about 10 feet.

Thermocrosis, in physics, heat coloration. A red flame, looked at through a red glass appears quite bright, but through a green glass it appears dim or scarcely visible. So in like manner heat which has traversed a red glass passes through another red glass with little diminution, but is almost completely stopped by a green glass. To these different obscure calorific rays Melloni gave the name of thermocrosis.

Thermodynamic Engine, any form of heat engine (as gas or steam engines) by means of which a percentage of the heat lost by one body called the source, on account of its connection with another body called the refrigerator, is converted into kinetic energy or mechanical effect, and made available for the performance of work. The efficiency of a heat engine is the ratio of the heat available for mechanical effect to the total heat taken from the source. A reversible engine is called a perfect engine, because it is the most efficient engine between the temperatures of its source and refrigerator.

Thermodynamics, the branch of theoretical physics which treats of heat as a mechanical agent, and is the basis on which the modern doctrine of energy is built. The second interpretation given by Newton of his third law of motion all but enumerates the principle of the conservation of energy. Ignorant, however, of the true nature of heat, he was unable to trace the mechanical loss caused by friction to its final issue. Not till more than a century after the publication of the "Principia" was any attempt made to fill the gap, and then the valuable experimental results of Rumford (1798) and Davy (1799), though conclusively disproving the accepted caloric theory, were given to an unappreciative world, and failed to excite any real interest till 40 years later, when their discoveries were rediscovered. In 1812 Davy wrote, "The immediate cause of the phenomenon of heat then is motion, and the laws of its communications are precisely the same as the laws of the communication of motion." Here then the dynamical theory of heat was enunciated, but it was carried no further, and not till the experiments of Colding and Joule, executed independently about 1840, were published, can thermodynamics be regarded as established.

About the same time Séguin and Mayer approached the same subject, and deduced from experiment values of the mechanical equivalent of heat. They, however, went to work on hypotheses or rather different forms of the same hypothesis which we now know to be false; so that their claims as the founders of the doctrine of energy cannot be maintained against those of Colding and Joule, who went to work in a legitimate way. Mayer, however, deserves great merit for the manner in which he developed and applied the conservation principle. In the more restricted sphere of thermodynamics, Clausius, Rankine, and Thomson have been the great developers; and to the last-mentioned is due the modification of Carnot's forgotten cycle of operations to suit the true theory, and the deduction therefrom of the doctrine of the dissipation of energy.

Thermodynamics is based on two laws. The first law enunciates heat to be a form of energy and subject to the conservation principle — an experimental truth rigorously established by Joule. Clerk Maxwell gives it in the form: When heat is transformed into work or work into heat, the quantity of work is mechanically equivalent to the quantity of heat. A given quantity of work can always be transformed into an equivalent quantity of heat; but in transforming heat into work a certain limitation exists which is expressed in the second law of thermodynamics. This law asserts that it is impossible, by physical processes, to transform any part of the heat of a body into mechanical work except by allowing heat to pass from that body to another at a lower temperature; or in Thomson's words, it is impossible by means of inanimate material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects. This is the law on which Carnot's principle is based — a principle which has led to results of the highest consequence. The principle is that the efficiency of a reversible engine is the greatest that can be obtained from a given range of temperature. Now a reversible engine in Carnot's sense, is an altogether unrealizable heat engine, which can be made to go through a complete cycle of operations, either forward or backward. In other words, not merely is the engine able to do work while it transforms a given quantity of heat from the boiler to the condenser, but, by an expenditure of an equiv-

alent quantity of work upon it, may be made to take back the same quantity of heat from the condenser to the boiler. In subjecting such an engine to a cycle of operations, the engine must be brought back to its original condition before any conclusion can be drawn regarding the relation between the heat which has disappeared and the work which has been done.

Séguin, when he assumed that the work done by an expanding heated body was the equivalent of the heat which it loses, and Mayer, when he went to work on the hypothesis that the amount of heat produced in compressing a gas is equivalent to the work done in compression, violated this principle, so that their conclusions were logically untrustworthy. It is easily demonstrable, on the conservation principle, that Carnot's reversible engine is the most perfect possible engine, and that consequently all reversible engines working between the same temperatures have the same efficiency. For a small difference of temperature the efficiency is a function only of the temperature, and this efficiency, divided by the difference of temperatures, is called Carnot's function. Thomson, defining temperature as the reciprocal of Carnot's function, has constructed a scale of temperature absolutely independent of the nature of the thermometric substance. Hence if t is the temperature measured according to this absolute scale of the source of heat, and t' that of the refrigerator or condenser, the efficiency may be expressed by the fraction $\frac{t-t'}{t}$. Now the efficiency is defined as the ratio of the work done to the heat supplied expressed in dynamical measure. Hence, if W is the work done, H the heat supplied to the engine, and h the heat given out to the condenser, all expressed in dynamical measure we have

$$\frac{W}{H} = \frac{t-t'}{t}$$

$$W = H - h$$

whence

$$\frac{h}{H} = \frac{t'}{t}$$

or, in a reversible engine, the heat rejected is to the heat received as the absolute temperature of the refrigerator is to the absolute temperature of the boiler. From the first of these equations it is evident that the heat supplied cannot be wholly transformed into work unless the refrigerator is at absolute zero of temperature, a practical impossibility. Consequently, in a material system only a part of the intrinsic energy is available for work, and this available portion or entropy is continually diminishing because of the universal tendency of heat to diffuse itself, and reduce the system to a uniform temperature, when of course no work can be produced. This is Thomson's principle of the dissipation of energy.

Thermoelectricity, electricity produced at the junction of two metals, or at a point where a molecular change occurs in a bar of the same metal, when the junction or point is heated above or cooled below the general temperature of the conductor. Thus when wires or bars of metal of different kinds, as bismuth and antimony, are placed in close contact, end to end, and disposed so as to form a periphery or continuous circuit, and heat then applied to the ends or junctions of the bars, electric currents are produced. The thermoelectric battery, or pile, an apparatus much used in delicate experiments with radiant heat, consists of a series of little bars of antimony and bismuth (or any other two metals of different heat-conducting power), having their ends soldered together and arranged in a compact form; the opposite end of the pile being connected with a galvanometer, which is very sensibly affected by the electric current induced in the system of bars when exposed to the slightest variations of temperature. To the combined arrangement of pile and galvanometer the name of thermo-multiplier is given. Two metal bars of different heat conducting power having their ends soldered together, and the combined bar then usually bent into a more or less horseshoe or magnet form for the purpose of bringing their free ends within a conveniently short distance, designated a thermoelectric pair, are much used in thermoelectric experiments. But as the electric current developed in a single pair is very weak, a considerable number are usually combined to form a thermoelectric pile or battery. Bismuth and antimony are the metals usually employed, the difference in electromotive forces being greater between them than between any other two metals conveniently obtainable.

Thermograph, a thermometer provided with a recording device. The form generally used has a crescent shaped bulb, filled with alcohol and hermetically sealed. A change in the temperature affects the curve of the bulb, and the alteration of form is communicated to a series of multiplying levers, which in turn exaggerate the motion, and give impetus to a recording pen. This pen makes a tracing on the ruled paper of a moving cylinder. Bartlett's thermograph is espccially designed for greenhouses, having a register for indicating in the office the temperatures prevailing in the different houses. This apparatus is sometimes arranged so that a rise in temperature to 100° will ring a gong. Thus arranged it serves as a warning of fire.

Thermometer, in physics, an instrument for measuring intensity of heat, or temperature, by means of expansion of a liquid or gas. Mercury is generally employed, and an ordinary thermometer consists of a spherical or cylindrical glass bulb at the end of a very fine tube, the bulb being completely filled and the tube partly filled, with mercury, while the space above the mercury contains nothing except a small quantity of mercury vapor, which offers no resistance to the expansion of the mercury. A rise of temperature is indicated by a rise of the mercury in the tube, owing to expansion; and, conversely, a fall of temperature is indicated by a fall of the mercury in the tube. A graduated scale is attached with two fixed points: the lower, or freezing point, and the upper, or boiling point, of water. The distance between the two fixed points is then divided into a certain number of equal parts, or degrees, which are continued above and below the two fixed points. On the Centigrade or Celsius thermometer (used by scientific men all over the world and in general use on the continent of Europe), the distance between the two points is divided into 100 degrees, the freezing point being 0°, and the boiling point being 100°; on the Réaumur thermometer (used only in N. W. Europe), the distance is divided into 80 degrees, the freezing point being 0° and the boiling point 80°; on the Fahrenheit thermometer (in general use in the United States and England), the distance is divided into 180 degrees, but, since zero is 32 degrees below the freezing point, the freezing point is 32°, and the boiling point is 212°. Degrees above 0° are termed + degrees, while those below 0° are termed — degrees.

C. ÷ 5 × 9 + 32 = F.	F. — 32 ÷ 9 × 4 = R.
R. ÷ 4 × 9 + 32 = F.	C. ÷ 5 × 4 = R.
F. — 32 ÷ 9 × 5 = C.	R. ÷ 4 × 5 = C.

Mercury can only be used for temperatures between — 40° and + 675°, since it freezes at 40° and boils at 675°. For lower temperatures alcohol is used; and for high temperatures air thermometers are employed, in which changes of temperature are measured by the expansion or contraction of a known volume of air. In deep-sea thermometers, used for ascertaining the temperature of the sea, the bulb is specially protected against the pressure of the water.

Thermometer, Air. See AIR THERMOMETER.

Thermometric Alarm, an instrument to release an alarm when a dangerous heat is reached in an apartment; a form of fire alarm. One form consists of a bent glass tube with a bulb at each end, one of which with a part of the stem contains ether; the other with a part of the stem containing mercury and open to the external air. The tube is poised on its center by gravity. Should the temperature be raised by the presence of fire, the ether would be expanded, the mercury driven into the bulb, the instrument tipped over on its axis, and the alarm sounded.

Thermometric Analysis, in chemistry, a term applied to certain approximate methods of analysis, depending on the observation of the temperature when a phenomenon takes place, or of the changes of temperature accompanying chemical reactions — *e. g.*, fixed oils evolve different degrees of heat when treated with strong sulphuric acid, and the temperatures thus produced are used to determine the proportions of two in a mixture, or to identify two oils, especially when one is a non-drying and the other a drying oil. When 15 grams were treated with 7.5 grams, sulphuric acid of 90 per cent., the following rise of temperature was observed in the three oils tested: olive oil from 12–40°, rape oil from 17–54°, and linseed oil from 16–91°.

Thermometric Steam Gauge, a steam gauge which indicates the pressure in a boiler by the amount of expansion of a fluid at the temperature due to the pressure.

Thermometric Ventilator, a chimney valve consisting of a circular disk accurately balanced on a spindle. On one side of the disk is an inverted siphon, open at one end and having a bulb at the other. The lower part of the siphon tube contains mercury, and the bulb is full of air. Any increase of temperature expands the air in the bulb, depresses the mercury under the bulb, and, causing it to rise in the other arm of the tube, opens the valve, thus allowing the air to pass.

Thermomultiplier, an instrument invented by Nobili for measuring small variations of temperature due to radiant heat.

Thermonatrite, an orthorhombic mineral, usually occurring as an efflorescence; hardness, 1–1.5; sp. gr., 1.5–1.6; luster, vitreous. Composition: Carbonic acid, 35.5; soda, 50.0; water, 14.5 = 100, which is equivalent to the formula $NaOCO_2 + HO$. Found in lakes and about some mines and volcanoes.

Thermophone, an instrument for ascertaining the temperature at a distant point, as at the bottom of a lake, with the aid of the ear. It is based on the principle that the resistance of a subject to an electric current varies with its temperature. The degree differs with the material, and two metals of opposite characteristics are used; copper, whose electrical resistance increases 1 per cent. for each 5° F. of temperature, and German silver, which requires a rise of 50° in temperature to affect a like change in its resistance. A Wheatstone's bridge is formed with these metals for arms. The coils are sealed in brass tubes, and con-

nected by wire at the point where the temperature is to be read. A movable contact is arranged on a slide-wire, and connected by a leading wire at a point central between the coils. The galvanometer usually employed with a Wheatstone's bridge is replaced by a telephone and interrupter. This apparatus may be used to note the electrical balance between the two metals at the distant point, and as the electrical balance bears a definite relation to the temperature, the latter is arranged to be read direct from a dial. To use the instrument, the telephone is placed to the ear and the pointer of the dial slowly shifted. Till the point of electrical balance is reached, a buzzing sound is heard, but as soon as this point is found it stops, and the dial on which the pointer is stopped registers the temperature at the distant point.

Thermophyllite, a mineral occurring in aggregated masses of small micaceous scales, which exfoliate before the blowpipe; hardness, 2.5; luster on cleavage faces, pearly; color, yellowish to light-brown. It is a hydrated silicate of magnesia, which Dana includes in his group of serpentines. It has been regarded as a crystallized form of the mineral serpentine. Found at Hopansuo, Finland.

Thermopylæ, a famous pass leading from Thessaly into Locris, and the only road by which an invading army can penetrate from Northern into Southern Greece. It lies S. of the present course of the river Spercheius, between Mount Œta and what was anciently an impassable morass bordering on the Maliac Gulf. In the pass are several hot springs, from which Thermopylæ probably received the first part of its name. Thermopylæ has won an eternal celebrity as the scene of the heroic death of LEONIDAS (*q. v.*) and his 300 Spartans in their attempt to stem the tide of Persian invasion (480 B. C.). Again in 279 B. C. Brennus, at the head of a Gallic host, succeeded, through the same treachery that had secured a victory to Xerxes, in forcing the united Greeks to withdraw from the pass.

Thermopylæ of America, a phrase applied to Fort Alamo, Tex.; in allusion to the heroic defense of it, made in 1836, by a small body of Texans against a force of Mexicans 10 times their number. During the subsequent struggle for independence the Texan war cry was "Remember the Alamo!" the Mexicans having murdered the six defenders of the fort whom they found alive on its surrender.

Thermoscope, an instrument for indicating relative differences of temperature. The term was applied by Count Rumford to an instrument invented by him, and similar in principle to the differential thermometer of Professor Leslie.

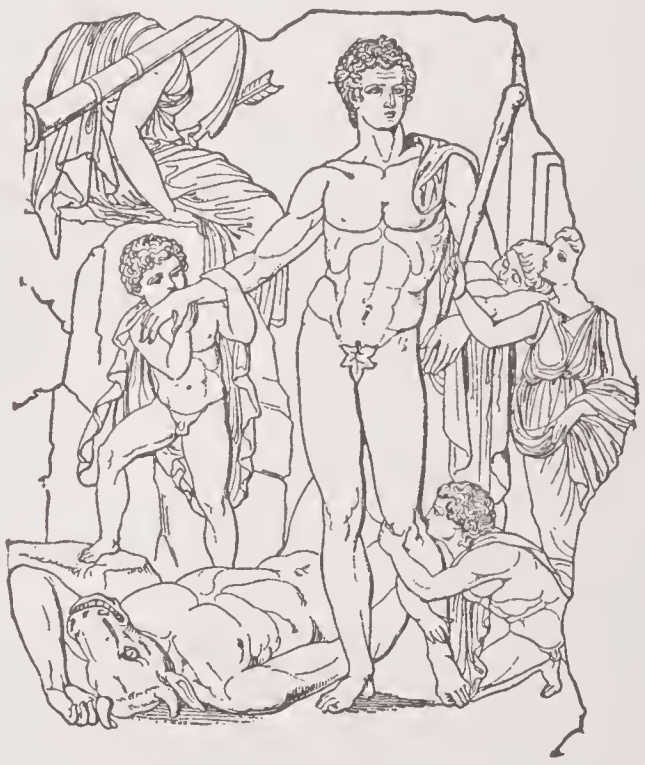
Thermostat. See ELECTRIC ALARM.

Theroid, animal; having animal propensities or characteristics; specifically applied to idiots, who in habits or appearance resemble any of the lower animals. The word is of recent introduction, but the extraordinary resemblances presented by some of the weak-minded to certain birds and mammals have attracted attention for a very long period. Pinel speaks of "a young female idiot * * * who, in the form of her head, her tastes, her mode of living, seemed to approach to the instincts of a sheep."

Theropoda, in palæontology, an order of Cope's sub-class *Dinosauria*, consisting of carnivorous forms, which are believed to have preyed on the weaker herbivorous members of the class. Feet digitigrade, digits with prehensile claws; vertebræ more or less cavernous; fore limbs very small, limb bones hollow. The order comprises four families (*Megalosauridæ, Zanclodontidæ, Amphisauridæ,* and *Labrosauridæ*) and two groups or sub-orders (*Cœluria* and *Compsognatha*).

Thersites, in mythology, son of Agrius, whom Homer, in the "Iliad," makes the ugliest and most impudent of the Greeks before Troy. His name became a synonym for dastardly impudence. Later poets say he was slain by Achilles for calumniating him.

Theseus, in heroic history, a King of Athens, and the son of Ægeus by Æthra the daughter of Pittheus, was educated at the



THESEUS AND THE MINOTAUR.

house of his father-in-law at Trœzene. On arriving at years of maturity he was sent by his mother to Athens, a sword being given him by which he might make himself known to Ægeus. On his way from Trœzene he destroyed Corynetes, Sigomis, Sci-

ron, Cercyon, Procrustes, and the celebrated Phæa. He was not well received at Athens, and Medea attempted to poison him before his arrival was publicly known. The Pallatides, who attempted to assassinate him, he put to death by his own hand. He next destroyed the bull of Marathon; and at Crete, by means of Ariadne who was enamored of him, he killed the Minotaur, and thereby redeemed the Athenians from the annual tribute of seven chosen youths and as many virgins to be devoured by the monster. On ascending his father's throne he ruled the Athenians with mildness, made new laws and regulations, and by his policy won the friendship of the King of the Lapithæ. Theseus, in conjunction with Pirithous, carried off Helen, the daughter of Leda, but whom he was compelled to restore. While he was in captivity, Mnestheus obtained the crown, and Theseus on his return attempted to eject the usurper, but, failing, he retired to the court of Lycomedes, a king of the island of Scyros, who, jealous of his fame, carried him to a high rock and threw him down a precipice. The children of Theseus, after the death of Mnestheus, recovered the Athenian throne.

Thesis, a brief statement of an opinion, view, or proposition, which he who states it is prepared to prove by detailed argument. In a special academic sense thesis means the dissertation which candidates for certain university degrees are obliged to give in, and which in former times they were required to defend publicly against all comers.

Thesmophoria, an ancient festival held exclusively by women in several districts of Hellas, especially Athens and Arcadia, in honor of Demeter Thesmophoros ("the lawgiver") as the foundress of agriculture, and thereby of ordered civil life, with the institution of marriage. At Athens the festival extended to three days, beginning with Oct. 24. On the first day there was a procession to the temple of Demeter at Halimos, S. E. of the city; on the second a strict fast; and on the third day, called Kalligeneia ("the bearer of a fair offspring"), a joyous and unrestrained carousal. The licentiousness of the Thesmophoria is caricatured in the "Thesmophoriazouzai" of Aristophanes.

Thesium, in botany, the bastard toad flax; a genus of *Santalaceæ*. Flowers small, green; perianth four or five-cleft, persistent; stamens with a small fascicle of hair at their base; stigma simple; ovary inferior; ovules three; drupe ribbed, crowned with the persistent perianth. Known species about 60, all from the Eastern Hemisphere. *T. linophyllum* is a perennial parasite on roots, with diffuse stems, one-nerved leaves, minute flowers, green outside, white inside, with green ovoid fruit.

Thesmothete, in Greek antiquity, a lawgiver; a legislator; one of the six inferior archons at Athens who presided at the election of the lower magistrates, received criminal informations in various matters, decided civil causes on arbitration, took the votes at elections, and performed a variety of other offices.

Thespesia, in botany, a tribe of *Hibisceæ*. Trees with large entire leaves; involucre three-leaved, deciduous; calyx truncate; style simple; stigmas five; fruit almost woody; capsule with five cells, each with about four seeds. *T. populnea* is a tree 40 or 50 feet high, with the foliage so dense at the top that it has been called the umbrella tree. It has roundish, cordate, pointed, five to seven-veined leaves; the flowers, which are large, are yellow, with a dark-red center. The tree is very common along the seacoast of South America, the West Indies, the Pacific Islands, part of Africa, India, and Burma. It has been planted along roadsides throughout India, and especially in Madras city. It yields a gum, a deep-red, somewhat thick oil, used in cutaneous affections. The capsule and flowers furnish a yellow dye, and the bark a good fiber. *T. lampas* is a small bush, common in the tropical jungles of India, with a good fiber, as has *T. populnea*.

Thespian (from the name of Thespis, the reputed founder of the Greek drama, who was born in Xarca, Attica, and flourished about 550 B. C.), pertaining or relating to the representation of dramatic tragedy, or to the Tragic Muse; as the Thespian art.

Thespius, in mythology, a King of the Thespiades, and father of 50 daughters, all of whom bore children to Hercules. The Thespiades were conducted to Sardinia by Iolus.

Thessalonians, Epistles to the, the Pauline epistles. The first epistle to the Thessalonians, the earliest extant epistle of the Apostle Paul, was written at Corinth probably about the beginning of the year A. D. 53, or, at latest, in A. D. 54, within a year and a half of the founding of the Church at Thessalonica under the circumstances related in Acts, xvii: 1-10. Some time after leaving Thessalonica, the apostle had heard of "sufferings" to which his converts there had been subjected by their unbelieving fellow-countrymen (I Thess. ii: 14; iii: 2-4), and there was some cause for fear lest "the tempter" had "tempted" them from their faith (iii: 5). He accordingly sent Timothy from Athens to learn further about their state, and to "establish" and "comfort" them (iii: 2, 5). Timothy brought back to the apostle, then in Corinth, a fairly satisfactory account of their faith and loyalty, but mentioned some matters of Christian

doctrine and life in which they were deficient; hence the epistle.

Of the two parts of which it is composed the first is mainly personal and explanatory (i.-iii.), and the second ethical and doctrinal (iv., v.), warning in particular against sins of impurity, perhaps also of commercial greed (iv: 6), and still more specially against a tendency of the Thessalonians toward pious idleness in view of Christ's imminent second coming and toward a hopeless sorrow on account of those of their number who had already died. With regard to the second coming, the apostle's own doctrine is that it may be expected at any time, and that diligence and watchfulness are therefore necessary; and he clearly anticipated that at latest it would take place before the generation then living had wholly passed away. Baur, who was the first to deny the genuineness of this epistle, has not been followed in this by the more recent representatives of the Tübingen school.

The second epistle consists of three parts, The first part is introductory, and mainly an expression of the writer's thankfulness for the steadfastness the Thessalonians have displayed under continued persecution (i. 1-12). The second part (ii. 1-12) is eschatological, and warns the readers against supposing "that the day of the Lord is now present" (so revised version; authorized version has "at hand"). On the contrary, it will not be except the falling away ("the apostasy") come first, and the man of sin be revealed, the son of perdition, he that opposeth and exalteth himself against all that is called God or that is worshiped; so that he sitteth in the temple of God, setting himself forth as God. This mystery of lawlessness is already at work, only there is one that restraineth. When this restraining presence or influence shall be taken out of the way, then shall be revealed the lawless one, whom the Lord Jesus shall slay with the breath of His mouth, and bring to nought by the manifestation of His coming. The coming of the lawless one is to be according to the working of Satan with all powers and signs and lying wonders and with all deceit of unrighteousness. The third and concluding part of the epistle (ii. 13-iii. 18) is of a practical nature, and substantially repeats the exhortations of I Thessalonians.

The genuineness of this epistle was first doubted by J. E. Ch. Schmidt (1801); the volume of opinion in this sense has steadily increased since then, and is now very great. The argument turns chiefly on ii. 1-12; in the rest of the epistle there is nothing that can be called un-Pauline, and the question of its absolute genuineness apart from these verses is comparatively unimportant. The difficulty about the eschatological passage in question is, in a word, that no traces of such a view occur in any other writing of the Apostle Paul, whether prior or subsequent to the supposed date of II Thessalonians.

Indeed the difficulty of reconciling it with the ordinary Pauline view is suggested by the passage itself: "be not quickly shaken . . . by epistle as from us, as that the day of the Lord is close at hand" (*enest ke*); but this is practically the suggestion of I Thessalonians.

It is impossible to fix with any accuracy the date of the verses in question. They are conceived in the spirit of a great deal of the apocalyptic that was current in Jewish (and in a less degree in Christian) circles during the last two centuries of Judaism; and, with certain modifications, the ideas admitted of application to a considerable variety of circumstances, now to those of the Jews under Caligula, now to those of the Jews or Christians under Nero. On the hypothesis of its genuineness, in whole or in part, II Thessalonians must have been written shortly after I Thessalonians and before the apostle's sojourn of 18 months in Corinth had come to an end. Apart indeed from ii. 1-12, II Thessalonians may conceivably have been written before I Thessalonians, a view which has been argued for by Grotius among others.

Thessalonica. See SALONICA.

Thessaly, the largest division of ancient Greece; lay S. of Macedonia and E. of Epirus; being separated from the latter by Mount Pindus, and from the former by the Cambunian Mountains; the Maliac Gulf and Mount Œta bounding it on the S. It is a vast plain shut in on every side by mountains; on the N. and W. by those already named, on the S. by Mount Othrys, and on the E. by Mounts Pelion and Ossa, the only opening being the Vale of Tempe in the N. E., between Ossa and Olympus. This plain is drained chiefly by the Peneus river (now Salambria) and its tributaries, and is the most fertile in all Greece. Thessaly was originally inhabited by so-called Pelasgians, who, however, were either expelled or reduced to slavery by Dorian immigrants from the more rugged region of Epirus about 1000 B. C. The Penestæ, descendants of the old inhabitants, held a position analogous to that of the Helots in Sparta. There were four districts — Hestiæotis, Pelasgiotis, Thessaliotis, and Phthiotis; Magnesia on the coast being a minor division. The government appears to have been oligarchial in the separate cities — of which Pharsalus, Larissa, Heraclcum, and Pheræ were the chief — the principal power being in the hands of the two great families of the Aleuads and Scopads. About 374 B. C. Jason, tyrant of Pheræ, was elected Tagus (chief-magistrate) of all Thessaly. The rule of Jason's successors became so un-

bearable that aid was sought from Philip of Macedon, who in 344 subjected the country to Macedonia. Thessaly remained subject to the Macedonian kings till the victory of Cynoscephalæ, in 197 B. C., brought it under the protection of Rome. Under the emperors Thessaly was united with Macedonia, but after Constantine it was a separate province. In A. D. 1204 with other portions of the Eastern Empire, it came under the dominion of the Venetians, and in 1355 was taken by the Turks. The restoration to Greece of Thessaly S. of the Salambria was recommended by the Berlin Congress in 1878; and subsequently various modifications of the Greco-Turkish frontiers were proposed, the Greeks endeavoring to secure the cession of the whole of Thessaly. War between Greece and Turkey seemed imminent; but in 1881 Turkey agreed to cede, and Greece to accept, Thessaly S. of the ridge of mountains forming the watershed of the Salambria (the ancient Peneus), by much the largest and most fertile section of the province. The Greek portion constitutes the three nomarchies of Larissa, Trikhala, and Phthiotis with Phocis. See GRECO-TURKISH WAR.

Thetines, the name given to a series of sulphur compounds analogous to betaine and its homologues, and represented by the formula,

$$\begin{matrix} CH_2 - S(C_nH_{2n+1})_2 \\ | \quad\quad | \\ CO - O \end{matrix}$$

The methyl and ethyl compounds are the only ones at present known; thus,

$$\text{methyl thetine, } \begin{matrix} C_4H_8SO_2 = CH_2 - (SCH_3)_2 \\ | \quad\quad | \\ CO - \quad C \end{matrix}$$

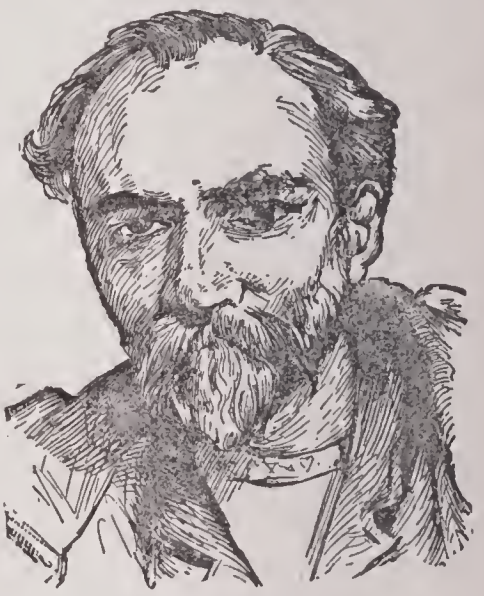
, obtained by mixing bromacetic acid with methyl sulphide in molecular proportions.

Thetis, in mythology, one of the sea deities, who was courted by Neptune and Jupiter. But when the gods were informed that the son she would bring forth must become greater than his father, they ceased their solicitations; and Peleus, the son of Æacus, was permitted to gain her hand. Thetis became mother of several children, among them Achilles whom she rendered invulnerable by plunging him in the waters of the Styx, except that part of the heel by which she held him.

Thetis, in zoölogy, a genus of *Myacidæ*. Shell sub-orbicular, ventricose, thin, translucent, granulated on the surface, and with a slightly nacreous interior. Hinge teeth one or two. Known species: Recent five from Great Britain, France, India, etc.; fossil 17, from the Neocomian of Great Britain, Belgium, France, and Southern India onward.

Theurgy, the working of some divine or supernatural agency in human affairs; a working or producing effects by supernatural means; effect or phenomena brought about among men by spiritual agency; specifically: (1) Divine agency or direct interference of the gods in human affairs, or the government of the world. (2) The act or art of invoking deities or spirits, or by their intervention conjuring up visions, interpreting dreams, receiving or explaining oracles, etc.; the power of obtaining from the gods by means of certain observances, words, symbols, or the like a knowledge of the secrets which surpass the power of reason, to lay open the future, etc. (3) That species of magic which more modern professors of the art allege to produce its effects by supernatural agency, as contradistinguished from natural magic. (4) A system of supernatural knowledge or power believed by the Egyptian Platonists to have been divinely communicated to a hierarchy, and by them handed down from generation to generation.

Theuriet, André, a French author; born in Marly le Roi, near Paris, Oct. 8, 1833; studied law in Paris, and received in 1857 a place in the office of the minister of finance. That same year he published a striking poem in the "Review of Two Continents," which was followed only in 1867 by "The Woodland Road," a volume of poems full of the charm of woodland. Later poems were "The Peasants of Argonne, 1792" (1871), and "Blue and Black" (1872). But Theuriet is best known by his novels, which include: "Mlle. Guignon" (1874); "The Marriage of Gerard" (1875); "The Fortune of Angeli" (1876); "Aunt Aurelie" (1884); etc. He died April 23, 1907.



ANDRÉ THEURIET.

Thevetia (named by Linnæus after its describer, Thevet, a French Franciscan, of the 16th century), in botany, a genus of *Carisseæ*. Inflorescence consisting of terminal or lateral cymes. Caylx five-parted, with many glands inside at its base; corolla salver-shaped, closed by four scales; fruits slightly fleshy, with a hard stone inside. *T. neriifolia* is cultivated in tropical America, whence it has been introduced into India. The milky juice is very poisonous, the bitter and cathartic bark is a febrifuge, and an oil extracted from the kernels is emetic and purgative. The seeds

of *T. ahovai* are poisonous, the bark and sap emetic and narcotic. The wood of both has a heavy odor and is used for poisoning fish.

Thevetosin, a glucoside obtained from the seeds of a species of *Thevetia*, growing in Mexico. It crystallizes in four-sided prisms, is soluble in alcohol, and when heated with dilute sulphuric acid is resolved into glucose and a resinous body. It is said to be very poisonous, acting as an emetic.

Thiacetic Acid, $(CH_3)COSH$; sulphydrate of acetyl; an acid discovered by Kekulê and formed by the action of pentasulphide of phosphorus on glacial acetic acid. It is a colorless liquid, boiling at 93°, smells like acetic acid and hydrogen sulphide, and is slightly soluble in water, but mixes in all proportions with alcohol and ether. With solution of lead acetate it forms a crystalline precipitate $=(C_2H_3OS)_2Pb$.

Thiaki. See ITHACA.

Thialdine, $C_6H_{13}NS_2$; obtained by passing a current of sulphydric acid gas into aldehyde ammonia. In a few hours thialdine crystallizes out. When recrystallized from a solution of ether and alcohol it separates in large rhombic tables, strongly refracting, and having a density of 1.19. It has an aromatic odor, melts at 43°, volatilizes at ordinary temperatures, very slightly soluble in water, easily soluble in alcohol and ether. It has no action on vegetable colors, but dissolves in acids, forming soluble and crystallizable salts.

Thianisoic Acid, $C_{10}H_{14}O_2 \cdot SO_2$; a monobasic acid containing the elements of anise-camphor and sulphurous acid. Anethol is boiled with nitric acid, and the oil produced distilled. The distillate between 215° and 245° is left in contact with acid sodium sulphite and alcohol, the sodium salt crystallizing out. The acid can be obtained in crystals from its barium salt by the addition of sulphuric acid. It has an astringent taste, is easily soluble in water, alcohol, and ether, and forms crystallizable salts.

Thianisol, a white pulverulent substance formed by the action of ammonium sulphide on anishydramide.

Thian-Shan ("celestial mountains"), a lofty chain in the heart of Central Asia; extends for 6,000 miles from Karakali in the S. W. to Barakul in the N. E.; increases in breadth from E. to W., sending off various spurs at right angles, among them Terek-Tagh, Alexander range, Transilenian, Atalan, etc. On the W. shore of Lake Issik-Kul the main range has a breadth of 900 miles. In the central part the peaks attain a height of 24,000 feet, and the passes, which are about 19,000 feet high, are partly covered with glaciers. Little is yet known of the geological structure of the Thian-Shan, but, according to recent accounts, the formation in the N. W. is Palæozoic. Granite and syenite are widely distributed, and together with white dolomitic limestone are found metamorphic schist and dark limestone. Active volcanoes are unknown, but there is an extinct crater near Urumsci, near the center of the range.

Thibaudeau, Antoine Claire, Count, a French statesman; born in Poitiers, France, March 23, 1765. Among his writings are: "Memoirs on the Convention and the Directory" (1824); "General History of Napoleon Bonaparte" (5 vols. 1827–1828); "Memoirs on the Consulate and the Empire" (10 vols. 1835); "History of the States-General" (2 vols. 1843). After his death appeared "My Biography: My Memoirs 1765–1792" (1875). He died March 8, 1854.

Thibaudia, in botany, a genus of *Vacciniaceæ*, chiefly from Peru. Leaves leathery, evergreen; calyx five-toothed; corolla tubulose, with a five-toothed limb; stamens 10, anthers two-horned. Wine is made from the fruit of *T. macrophylla*, and an aromatic tincture, used as a remedy for toothache, from *T. puercine*.

Thibault, Jacques Anatole. See FRANCE, ANATOLE.

Thibaut, Anton Friedrich Justus, a German legist; born in Hameln, Germany, Jan. 4, 1772. His greatest work is "System of the Laws in the Pandects" (1803); some of his other writings are: "Juristic Encyclopedy and Methodology" (1797); "Essays on Questions of Civil Law" (1814). He died March 28, 1840, in Heidelberg, where he was professor in the university.

Thick-footed Bat, in zoölogy, the *Vesperugo pachypus*, from Northern India, Tenasserim, the Andaman and Philippine Islands, Java, and Sumatra. It is about three inches long, including the tail; fur bright reddish-brown above, paler beneath. The feet are furnished with circular disks, probably organs of adhesion, analogous to those present in the genus *Thyroptera*.

Thickknee, a genus of birds of the family *Otididæ*. In haunts and habits they closely resemble the bustard, but they differ from them chiefly in having the bill longer, the wings more pointed, and the tarsus finely reticulated before and behind. They are partly nocturnal; their flight is strong and rapid, but somewhat labored; their call notes are loud and discordant. Thickknees run with great speed. They are generally very shy, and are found chiefly in desert places. There are 11 species, widely distributed, being absent only from North America. Only one species is European. It occurs in Great Britain, and is known as the common thickknee (*O. crepitans* or *scolo-*

pax), and also as the thickkneed plover, thickkneed bustard, great plover, Norfolk plover, and stone curlew. It is found in many parts of England on chalk downs and open heaths. A few specimens have been found in Ireland, and it has been recorded from Scotland. Worms, slugs, insects, frogs, and field mice constitute its food. They build no nest, but choose a depression in the ground in which to lay their eggs, generally two in number.

Thick-legged Bats, in zoölogy, the *Emballonuridæ;* a family of *Microchiroptera,* generally distributed throughout the tropical and sub-tropical regions of both hemispheres, rarely extending N. or S. of the 30th parallels of latitude. The muzzle is obliquely truncated, and the tail either perforates the interfemoral membrane or is produced far beyond it. The family is approximately equivalent to the old family *Noctilionidæ,* and contains two sub-families: *Emballonurinæ,* with 10 genera, arranged in five groups — *Furiæ* (2), *Emballonuræ* (5), *Diclidurі* (1), *Noctiliones* (1), and *Rhinopomata* (1); and *Molossinæ.*

Thick-tailed Galago, in zoölogy, the *Galago crassicaudatus,* from S. tropical Africa. It is about the size of a domestic cat, with brown fur, and a great bushy tail, three or four inches longer than the body.

Thick-tailed Opossum, the *Didelphys crassicaudatus,* from Brazil and Paraguay, ranging S. to the Plata river. It has no marsupial pouch, but vestiges of it remain in the folds of skin with which the six mammæ are covered.

Thieblin, Napoleon L,. a Russian author; born in St. Petersburg, Russia, June 6, 1834; was among the revolutionists in the uprising in Western Europe which resulted in 1848 in the Petrashesky conspiracy which penetrated the schools and universities; sent to the Academy of Artillery, and in 1853 was graduated as a sub-lieutenant; saw active service on the Danube, and in the trenches about Silistria during Russia's war with the Allied Powers. Before Sebastopol, when only 20 years old, he commanded 40 cannon, and at the fall of the city was decorated and transfered to the Imperial Guards; withdrew from the service in 1857, and set about the study of philosophy and literature; settled in London, and made friends of Herbert Spencer, Thackeray, and Frederick Greenwood, of the "Pall Mall Gazette"; wrote numerous sketches of English life under the name of "Azamat Batuk," which were afterward published under the title "A Little Book about Great Britain." He contributed extensively to "Macmillan's Magazine," "London Society," the "Manchester Guardian," the "London Standard," and the "British Quarterly Review." He came to New York in 1874, and wrote sketches, foreign notes, and a series of articles on Wall Street signed "Rigolo" and "N. L. T." He died in New York city Nov. 1, 1888.

Thief, in ordinary language, one who steals or is guilty of theft; one who takes the goods or personal property of another without his knowledge or consent, and without any intention of returning it; one who deprives another of property secretly or without open force, as opposed to a robber, who uses open force or violence. In the times of Queen Elizabeth and James I. no such sharp distinction was made as we now draw between a robber and a thief. In Mat. xxi: 13, xxvi: 55; Mark xiv: 48; Luke x: 30; etc., the translation should have been robber instead of thief, and the penitent thief (Matt. xxvii:38–44, Luke xxiii: 39–42 of the Authorized Version) crucified with Jesus should have been designated the penitent robber. The word is also used as a term of reproach, and applied especially to a person guilty of cunning, deceitful, or secret actions.

Thierry, Amédée Simon Dominique, a French historian; born in Blois, France, Aug. 2, 1797; was made a member of the Institute, 1841, and senator, 1860. He assisted his brother Augustin in several of the great works produced by the latter, and himself wrote, "History of the Gauls" (1828); "History of Gaul under the Normans" (1840); "Stories and Tales of Roman History" (1860); "History of Attila and his Successors"; etc. He died in Paris March 27, 1873.

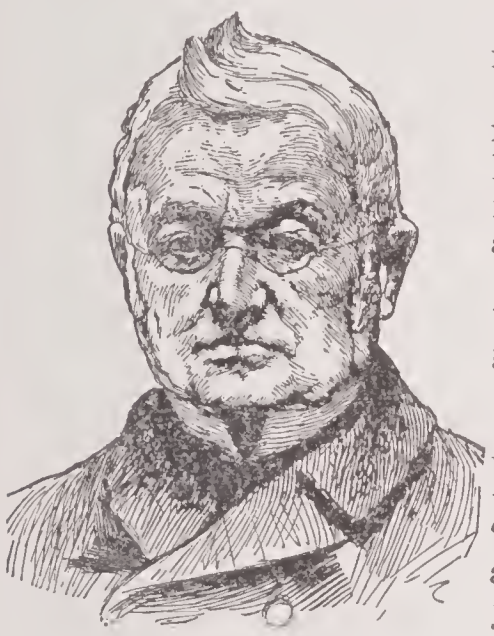
Thierry, Jacques Nicolas Augustin, a French historian; born in Blois, France, May 10, 1795. He was for some time associated as secretary and coadjutor with St. Simon, whose socialistic views he embraced. In 1816 he published a treatise entitled "The Nations and Their Mutual Relations." He did not fail to perceive the theoretical vagaries of his master, from whom he separated in 1817. His celebrated work on the Norman conquest of England was published at Paris in 1825, and attained great success both in France and in England. "Letters on French History" appeared in 1827. In 1834 he published, under the title of "Ten Years of Study," a series of admirable essays, and about the same time

JACQUES AUGUSTIN THIERRY.

he was summoned by Guizot, then minister of public instruction, to Paris, and intrusted with the editing of the "Account of the Unedited Historical Works on the Third Estate," for the collection of documents relative to the history of France. In 1840 he published "Account of the Times of the Merovingians." He died in Paris May 22, 1856.

Thiers, Jean Baptiste (tē-ār′), a French theological writer; born in Chartres, France, in 1636. His treatises on theological and ecclesiastical subjects are very numerous; but he owes whatever celebrity he has to his "History of Wigs, wherein is Shown their Origin, their Use, their Form, the Abuse and Irregularity of Ecclesiastics' Wigs" (1690). He died in Vibraye, France, in 1703.

Thiers (tē-ār′), **Louis Adolphe,** a French statesman; born in Marseilles, France, April 16, 1797. He studied law and at the age of 22 was admitted advocate. He soon relinquished law, however, for literature and politics (1821). Going to Paris, he began, after a lengthened struggle with poverty, to write for the "Constitutionalist" and other journals, and during the years 1823 to 1830 made a great reputation as a political writer. He took part with Armand Carrel and Mignet in the foundation of the "National" (1830) which aided in the downfall of the Bourbons; and during the July revolution of 1830, the office of the "National" was the headquarters of the revolutionary party. In the government of Louis Phillipe, Thiers held several offices, till (1840) he found himself at the head of the ministry for a few months, and then retired into private life. After the revolution of 1848 he was elected deputy to the Assembly, and voted for the presidency of Louis Napoleon, but was ever after one of his fiercest opponents; and at the coup d'état (Dec. 2, 1851) he was arrested and banished. Returning to France in the following year, he remained in comparative retirement till 1863, when he was elected one of the deputies for Paris.



LOUIS ADOLPHE THIERS.

During the terrible crisis of 1870–1871 he came to the front as the one supreme man in France. After the fall of Paris he was returned to the National Assembly, and on Feb. 17, 1871, he was declared chief of the executive power. The first duty imposed on him as such was to assist in drawing up the treaty of peace, whereby France lost Alsace and Lorraine and agreed to pay an enormous indemnity; his second was to suppress the Communist insurrection, which broke out within three weeks of the signing of the treaty. This done, his next task was to free the soil as quickly as possible from the invaders by the payment of the ransom, which also was effected in an incredibly short space of time. The Assembly in August, 1871, prolonged his tenure of office and changed his title to that of President. In November, 1872, Thiers declared himself in favor of the republic as a definitive form of government for France, and thus to some extent brought about the crisis which resulted in his being deprived of the presidency. He accepted his deposition with dignity, and went quietly into retirement. M. Thiers' chief works are: "History of the French Revolution" (6 vols. 1823–1827), and "History of the Consulate and the Empire" (20 vols. 1845–1862). The latter obtained for him the academic prize of $4,000. He died near Paris Sept. 3, 1877.

Thiersch, Friedrich Wilhelm, a German classical scholar; born in Kirchscheidungen, Prussian Saxony, June 17, 1784, studied theology and philology at Leipsic and Göttingen, and in 1809, following a call to the newly-founded Munich Lyceum, there founded a Philological Institute. The enthusiasm he had shown in the German War of Liberation he presently directed to Hellenic regeneration, and in 1831 visited Greece, where on the murder of Capo d'Istria he coöperated toward the election of Otto of Bavaria to the throne. Returning to Munich, he was elected president of the Academy in 1848. His most important work was his "Greek Grammar." He died in Munich Feb. 25, 1860.

Thierschite (after F. von Thiersch, the discoverer), a mineral substance occurring as an incrustation on the marbles of the Parthenon, Athens. Stated to be an oxalate of lime originating from the action of vegetation on the marble.

Thiethaldine, $C_6H_{12}(C_2H_5)NS_2$; prepared from ethylamine in the same way as thiamethaldine. Has not been obtained pure.

Thietsie, a resinous substance used as a varnish by the Burmese. It exudes from *Melanorrhœa usitatissima* in the form of a very viscid, light-brown liquid. The main portion is soluble in alcohol, and is very tenacious. The remaining portion is insoluble in ether, and changes, on exposure to the air, to a deep black and nearly solid substance.

Thigh Bone, the femur, the largest bone in the skeleton, situated between the os

innominatum and the tibia. In the erect position of the body it inclines inward, and slightly backward as it descends. At its superior extremity is its neck; its shaft terminates beneath in two condyles, united anteriorly, but separated posteriorly by a deep intercondylar fossa or notch.

Thilly, Frank, an American educator; born in Cincinnati, O., Aug. 18, 1865; was graduated at the University of Cincinnati in 1887, and studied at the Universities of Berlin and Heidelberg in 1887–1891; was instructor in logic and history of philosophy at the Sage School of Philosophy, Cornell University, in 1892-1893; Professor of Philosophy at the University of Missouri in 1893-1904; of Psychology at Princeton in 1904-1906; then of Philosophy at Cornell. Works include: "Leibniz's Controversy with Locke" (1891); "An Introduction to Ethics" (1900); a translation of "Paulsen's Introduction to Philosophy" (1895); and contributions to reviews on "The Freedom of the Will"; "Conscience"; "Locke's Relation to Descartes"; "The Moral Law"; etc.

Thimble, a metallic cap or sheath used to protect the end of the finger in sewing. Seamstresses use a thimble having a rounded end with numerous small pits or indentations. Those used by tailors are open at the end. The manufacture of thimbles is very simple. Coin silver is mostly used, generally silver dollars, which are melted, and cast into solid ingots. These are rolled into the required thickness, and cut by a stamp into disks of any required size. A solid metal bar the size of the inside of the intended thimble, moved by powerful machinery up and down in a bottomless mold of the size of the outside of the thimble, bends the circular disks into the thimble shape as fast as they can be placed under the descending bar. The work of brightening, polishing, and decorating is done on a lathe. First the blank form is fitted with a rapidly revolving rod. A slight touch of a sharp chisel takes thin shavings from the end, another does the same on the side, and the third rounds off the rim. A round steel rod, dipped in oil, and pressed on the surface gives it a lustrous polish. Then a small revolving steel wheel, whose edge is a raised ornamental design held against the revolving blank, prints that design just outside the rim. A second wheel prints a different design around the center, while a third wheel, with sharp points, makes indentations on the lower half and end of the thimble. The inside is brightened and polished in a similar way, the thimble being held in a revolving mold. The completed thimbles are boiled in soapsuds to remove the oil, brushed up, and packed for the trade. Thimbles are said to have been found at Herculaneum, and long ago used by the Chinese. Their invention in Europe is traditionally ascribed to Nicholas van Benschoten, of Amsterdam, in the 17th century. In mechanics, the name thimble is applied to various fixtures, such as a tubular lining through which a bolt passes, etc.

Thimble Coupling, in machinery, a kind of permanent coupling, of which the coupling box consists of a plain ring of metal, supposed to resemble a tailor's thimble, bored to fit the two connected ends of the shafts. The connection is secured by pins passed through the ends of the shafts and thimble, or by a parallel key or feather bedded in the boss ends of the shafts, and let into a corresponding groove in the thimble. Called also pump coupling or ring coupling.

Thimble Eye, nautically, an eye in a plate through which a rope is rove without a sheave.

Thimble Joint, a sleeve joint, with an interior packing to keep the joints of pipes tight during expansion and contraction.

Thimble Rig, a sleight-of-hand trick, performed by means of three thimbles and a pea. The pea being placed on a table and covered with one of the thimbles, the performer proceeds to shift the thimbles, covering the pea now with one, now with another, and offers to bet any bystander that no one can tell under which thimble the pea is. The person betting is seldom allowed to win, the pea being abstracted by sleight of hand.

Thing-steads. See Stone Circles.

Thinolite, a name given to a large shore deposit of tufaceous carbonate of lime which contains pseudomorphs of a mineral believed to have originally been gaylussite. E. S. Dana has pointed out that the angles of some of the crystals are not found to coincide with those of the latter mineral, and that the original mineral remains still unknown.

Thiobenzoic Acid, formula, $\begin{cases} C_6H_5 \\ COSH, \end{cases}$ an analogue of thiacetic acid, produced by mixing an alcoholic solution of potassium monosulphide with chloride of benzoyl. Hydrochloric acid added to the potash salt separates the acid as an oily body, which when left for some time deposits the acid in colorless crystals. When pure, it forms small rhombic tables, inodorous and tasteless, melts at 120°, is quite insoluble in water, slightly soluble in alcohol and ether, and easily in carbonic disulphide. It forms definite salts with bases.

Thiobutyric Acid, C_4H_8OS; an acid homologous with thiacetic acid, produced by the action of phosphoric protosulphide on butyric acid.

Thiocaprinaldine, a compound analogous to thialdine, formed, according to Wag-

ner, by the action of sulphydric acid on the ammonia compound of capric aldehyde.

Thiocarbanil, $CSNC_6H_5$; phenylic mustard oil; formed from the carbanilide by distillation with phosphoric anhydride, and by the action of phosgene on aniline. A colorless liquid, smelling like mustard oil, and boiling at 222°.

Thiocarbanilide, $CS \begin{matrix} —NH\ (C_6H_5) \\ —NH\ (C_6H_5) \end{matrix}$; formed by heating equivalent quantities of aniline and potash hydrate in alcoholic solution with excess of carbon sulphide. Dilute hydrochloric acid is added, and, after evaporation, the mass is crystallized from alcohol. It yields colorless laminæ, melting at 144°, insoluble in water, very soluble in alcohol and ether.

Thiochronic Acid, $C_5H_8S_4O_{14}$; obtained as a potassium salt when a hot solution of perchloroquinone is mixed with concentrated aqueous acid sulphite of potassium.

Thiocinnol, C_9H_8S; a pulverulent substance formed, with sulphide of ammonium, by the action of sulphydric acid on hydrocinnamide, $C_{27}H_{24}N_2 + 4H_2S = 3C_9H_8S + (NH_4)_2S$.

Thiocresol, in the plural, formula, $C_6H_4 \begin{matrix} CH_3 \\ SH \end{matrix}$; tolyl hydrosulphides; produced from the three isomeric toluene sulphonic acids by reducing the corresponding chlorides with zinc and hydrochloric acids. (1) Ortho-, shining laminæ, melting at 15°, boiling at 188°. (2) Meta-, liquid, not solid, at —10°. (3) Para-, large laminæ, melting at 43°, boiling at 188°.

Thiocyanic Acid, CHNS; obtained by decomposing lead thiocyanate in water, with sulphydric acid gas. Its solution is colorless, very acid, and not poisonous. Soluble thiocyanates give a blood-red color with ferric salts, thus affording a delicate test for hydrocyanic acid, if the latter be first converted into thiocyanate by yellow ammonium sulphide.

Thiocyanic Ether, in the plural, normal ethyl thiocyanate, $C \begin{matrix} N \\ S(C_2H_5) \end{matrix}$; a mobile, colorless, strongly-refracting liquid, with an odor like that of mercaptan. Boils at 146 degrees. Ethyl isothiocyanate = $N \begin{matrix} CS \\ C_2H_5 \end{matrix}$; differs in all properties from the normal compound. It boils at 134°, has the irritating odor of mustard oil, and unites directly with ammonia. These ethers exhibit isomerism like those of the alcohol cyanates and isocyanates, as clearly shown in the case of the ethyl compounds.

Thiodiglycollamide, $\begin{matrix} C_2H_2O \\ C_2H_2O \end{matrix} > (NH_2)_2S$, obtained by the action of sulphide of ammonium on chloracetamide in alcoholic solution. Recrystallized from water it forms small white octahedrons, which melt when heated.

Thiodiglycollic Acid, formula, $\begin{matrix} C_2H_2O \\ C_2H_2O \end{matrix} > S(HO)_2$; formed by boiling thiodiglycollamide with baryto-water as long as ammonia is evolved. By decomposing the lead salt and evaporating the filtrate the acid is obtained in crystals.

Thiodiglycollimide, $\begin{matrix} C_2H_2 \\ C_2H_2O \end{matrix} > HNS$; formed from the dehydration of acid thiodiglycollate of ammonia, and deposited in thin prismatic needles or laminæ from a hot aqueous solution. It is sparingly soluble in cold water, melts at 128°, and sublimes at a higher temperature.

Thioformic Acid, a compound formed in small quantity by the action of sulphydric acid on formate of lead. It yields small transparent crystals, having an alliaceous odor, is insoluble in water, and melts at 120°.

Thiofucusol, a substance produced by treating fucusol in alcoholic solution with sulphydric acid.

Thiofurfol, C_5H_4OS; thiofurfurol; a white crystalline powder, formed by the action of ammonium sulphide on furfurol, or of sulphydric acid on furfuramide.

Thioisatyde, $C_{16}H_{12}N_2S_2O_2$; formed by passing hydrogen sulphide into an alcoholic solution of isatin. It is a grayish-yellow, pulverulent, uncrystallizable substance, which softens in hot water and dissolves in alcohol.

Thiomelanic Acid, a sulphureted acid, found in the black mass produced by heating alcohol with excess of sulphuric acid. It is capable of forming salts with potash and other bases.

Thionamic Acid, $NH_3 \cdot SO_2$; produced by the action of dry ammonia gas on sulphurous anhydride. It is a crystalline volatile substance, very soluble in water, in which it quickly undergoes complete decomposition.

Thionamide, $N_2H_4(SO)$; produced by the action of sulphurous chloride on dry ammonia. It is a white pulverulent, non-crystalline solid.

Thionuric Acid, $C_4H_5N_3SO_6$; formed by the action of sulphurous acid and ammonia on uric acid or alloxan. On evaporating its solution, it yields a crystalline mass consisting of fine needles; is permanent in the air, has a very sour taste, and is very soluble in water. It is dibasic, and forms acid and neutral crystalline salts with bases.

Thionville (tē-*ong*-vēl; German, Diedenhofen), a town of Germany, in Alsace-Lorraine, on the Moselle. It is walled and otherwise fortified, and during the Franco-Prussian War it underwent a severe siege,

falling into the hands of the Germans Nov. 25, 1870.

Thionyl, SO; the radical of the sulphurous compounds.

Thiophenol, C_6H_5SH; formed by the action of pentasulphide of phosphorus on phenol. It is a colorless, mobile, fetid liquid, boiling at 168°, is insoluble in water, but dissolves easily in alcohol and ether.

Thiophosphamic Acid, $P(NH_2)H_2SO_2$; produced by the action of sulphochloride of phosphorus on aqueous ammonia. It has not been isolated, but forms a series of salts with bases, nearly all of which are uncrystallizable.

Thiophosphodiamic Acid, $P(H_2N)_2HSO$; formed by the action of ammonia gas on sulphochloride of phosphorus. It is obtained as a white mass, easily soluble in water, is monobasic, and forms a series of salts with bases.

Thiosinamine, $C_4H_5NS \cdot NH_3$; formed by the union of mustard oil with ammonia. It is obtained in colorless, prismatic crystals, having a bitter taste, is soluble in water, alcohol, and ether, melts when heated, but cannot be sublimed.

Thiosinaniline, $N_2(CS(C_3H_5)(C_6H_5)H_2)$; obtained by pouring oil of mustard into an equivalent of aniline dissolved in alcohol. It separates in foliated, colorless crystals, destitute of taste and smell, insoluble in water, very soluble in alcohol and ether, and shows but little tendency to combine with acids. Melts at 95°.

Thiovaleric Acid, the product of the action of phosphoric pentachloride on valerianic acid.

Third Eye-Lid. See NICTITATING.

Third Order, in ecclesiastical and Church history, a term which arose from the fact that when St. Francis had founded the Friars Minor (1209) for men, and St. Clare had founded the Poor Clares (1221) for women under a rule presented by him, he established a congregation called the Brothers and Sisters of Penance as a sort of middle term between the world and the cloister, with a separate rule, the members of which, men and women, married or single, "should be bound by rule to dress more soberly, fast more strictly, and practise works of mercy more systematically than ordinary persons living in the world." They had to undergo a year's novitiate and to take a simple vow to observe the rule. Many of these persons, in course of time, wished to live in community, and so congregations of the Third Order arose — true Franciscans with a rule of their own, distinct from that of the Friars Minors and that of the Poor Clares. Pope Benedict XIII., speaks of the Third Order "as a true and proper order, uniting in one seculars scattered all over the world and regulars living in community; distinguished from all confraternities as having its own rule, approved by the Holy See, novitiate, profession, and a habit of determinate form and material" (in the case of persons living in the world consisting of a brown scapular worn under the ordinary dress). The Dominicans have a Third Order, instituted by St. Dominic (1170–1221), but in what year is uncertain; the Augustinians established one at the beginning of the 15th, and Minims at the beginning of the 16th century, and their example has been followed by the Servites, the Carmelites, and the Trappists.

Third Termism, in United States history, a phrase that relates to the efforts of the friends of General Grant to procure for him a third term in the presidency. These efforts led to the division of the Republican party into two sections, known as "Stalwarts" and "Half-Breeds." The opponents of the movement produced an interesting array of historical facts to prove that the sentiment of the country had ever been against a third presidential term. In point of time the third-term idea, however, is as old as the time of Washington. When, on Sept. 17, 1796, in his farewell address to the people of the United States, George Washington told them of his resolution to "decline being considered among the number of those out of whom the choice is to be made" in the coming election, he established the precedent which has been followed ever since, of permitting no President to get three terms. Twice Washington had been elected, and each time by the unanimous vote of the Electoral College, but it was only at the earnest solicitation of the leaders of both parties that he consented to allow his name to go before the electors a second time. A third election, and probably with unanimity, would have been given him if he had permitted it. His example was decisive with Jefferson, Monroe, and Jackson, the only other Presidents who had the faintest chance of being chosen three times. More than once in the troubled days between Washington's retirement, in 1797, and his death in 1799 the thoughts of his countrymen, as did those of the Romans to Cincinnatus, turned to Washington for relief.

One of the objections which Jefferson brought against the Constitution when he got his first glimpse of it was the re-eligibility of the President, which it allowed. Writing from Paris to his friend Madison, on Dec. 20, 1787, three months after the close of the convention which framed the Constitution, he said, in regard to this re-eligibility: "Reason and experience tells us that the First Magistrate will always be reëlected if he may be reëlected. He is then an officer for life. This once observed,

Third Termism

it becomes of so much consequence to certain nations to have a friend or foe at the head of our affairs that they will interfere with money and with arms." Washington's example in resolutely declining a third term, which was followed by Jefferson himself, established the practice which destroyed the peril involved in the Constitution's silence as to the number of terms for which a President may be elected. Jefferson preferred a stipulation restricting the President to a single term, which he would make seven years. These views he subsequently modified to the extent that he favored a service of eight years instead of seven, with permission of being dismissed by the people in four years.

By the time that the presidency reached Monroe the barrier against a third term was securely fixed. Washington and Jefferson could have had three elections, but the country was beginning to tire of the "Virginia dynasty" before Madison's second term ended. The promise of a "vigorous foreign policy" against England extorted from him by the warhawks, Clay, Crawford, Calhoun, Lowndes, and Cheves, was, it was said, the price of Madison's nomination in 1812 for a second term. The country, however, was to have another Virginia President, for Monroe, who had been put on the presidential track before Jefferson's second term ended, captured the congressional caucus, which made nominations in those days, and got the candidacy. He was elected by 183 to 34 in 1816, and by 231 to 1 in 1820, in the so-called "era of good feeling," when there was only one organized party, the Republican (Democratic) in the country. Scarcely had Monroe's second election taken place, however, when a contest for the succession began, which was participated in by three members of Monroe's Cabinet — Adams, Secretary of State; Crawford, Secretary of the Treasury; and Calhoun, Secretary of War — and by three outside the Cabinet — Clay, Jackson, and De Witt Clinton. Of these, Adams, Jackson, Crawford, and Clay received electoral votes in 1824. Monroe was one of the most popular of all the Presidents, and he was seen at closer range by the people than any other President of the early days, because he traveled through the country more than any of them, and did more than any of them to cultivate friendly relations with all the elements of the population. Possibly he could have had a third nomination had he desired it, though despite his popularity he could scarcely have been elected, for the country by this time had grown weary of Virginia domination. One of the constitutional amendments which the Hartford Convention of 1814 suggested was a barrier against the election of a President from the same State twice in succession, and a good many people who were not Federalists would have favored a restriction of that sort after 1820.

Jackson was a two-term President who kept his hold on the masses of his party up to the end of his eighth year of service, even more successfully than did Jefferson. A few of Jackson's Democratic rivals, Calhoun and Crawford among them, imagined he would not accept a second term, and some of his close friends thought his feeble health would put him off the track at the end of his first term. Many of his political enemies, like Webster, Clay, and Ewing, believed he would be defeated if he tried to get a second election, but his old enemy, Adams, wiser than these, saw that the faults with which they reproached him — the introduction of the spoils system into politics, the assaults on the United States Bank, and the placing of the bottom stratum of his party on top — would help him for the time rather than hurt him with the unthinking, and win him friends among the masses. When Jackson in 1832 vetoed the bill to grant a new charter to the bank, Clay and his supporters thought Jackson was playing into their hands. But through the whole of this fight Jackson was sure of his ground. Probably most of the charges he made against the "money power" he believed to be true, and it is quite certain a large element of the people took them for gospel. Thus he got 219 votes, while Clay received only 49. Massachusetts, Rhode Island, Connecticut, Delaware, and Kentucky were carried by Clay, and five out of Maryland's eight electoral votes, but all the rest of the country, except Vermont, which was won by the Anti-Masons, went to Jackson, save South Carolina, which threw its vote away on John Floyd, of Virginia.

Jackson's 70 years of age and his feeble health did more than all his foes to keep him out of a third term. Retirement was almost as sweet to him when it came as it had been to Washington and Jefferson, and, unlike these, he named his successor and ruled through him. One of his biographers quotes a letter written by Jackson on March 2, 1837, two days before his retirement, in which he said: "On the 4th I hope to be able to go to the Capitol to witness the glorious scene of Mr. Van Buren, once rejected by the Senate, sworn into office by Chief-Justice Taney, also being rejected by the factious Senate." Van Buren's rejection was for the post of minister to England, in 1832, Jackson's foes, Calhoun among them, arranging the division in such a way that Calhoun, the Vice-President, should have the casting vote, thus wreaking revenge on Jackson and Van Buren at the same time. Taney's rejection was for Secretary of the Treasury in 1834 and for Asso-

ciate Justice of the Supreme Court early in 1835. The Senate had a double reason for striking down Taney — first, he was an appointee of Jackson's, and, secondly, after being made head of the Treasury and before his name was sent to the Senate he carried out Jackson's plans for an assault on the United States Bank, which two succeeding Treasury chiefs refused to do. Jackson won in the end, however, as he did in almost all his feuds, for 11 months after Taney's rejection for Associate Justice he was confirmed as Chief Justice to succeed John Marshall, who had just died, the personnel of the Senate having been changed considerably in the interval by the elections.

Long before Grant's second term had expired there was a feeling throughout the country that an attempt would be made to give him a third nomination, and a cry of "Cæsarism" was raised by the Democratic and Independent papers. In the beginning the third term idea found no favor except among the holders of Federal offices, but as these were numerous and as they manifested a devotion to the fortunes of their chief surpassing the fealty of civil subordinates to any other President since Jackson, the movement which they started promised ultimately to become dangerous. It encountered powerful opposition in the Republican party. Nevertheless it appeared to gain strength with the lapse of time. The Pennsylvania Republican State Convention of 1875, a year and a half before Grant's second term ended, adopted a resolution of "opposition to the election to the presidency of any person for a third term," which called forth a letter from Grant to the man who presided over the convention, in which he said: "I do not want it (a third term) any more than I did the first," but he added that exigencies might arise some time when it would be inadvisable to retire a President at the end of eight years.

The House of Representatives elected in the Democratic tidal wave year of 1874, the House, whose Speaker in the first session was Michael C. Kerr and in whose second session was Samuel J. Randall, the first Democratic House elected since 1856, passed a resolution introduced by W. M. Springer, of Illinois, on Dec. 15, 1875, which read thus: "That in the opinion of this House the precedent established by Washington and other Presidents of the United States in retiring from the presidential office after their second term has become, by universal concurrence, a part of our republican system of government, and that any departure from this time-honored custom would be unwise, unpatriotic, and fraught with peril to our free institutions." The resolution was adopted by a vote of 234 to 18. Every Democrat present and 70 out of the 88 Republicans who voted declared for the resolution. By this overwhelming majority, to which the Republican as well as the Democratic party contributed, did third termism receive its death blow.

Thirlage, an old servitude or rather service, enjoyed by the proprietor of a mill over the neighboring lands "thirled" to it, whereby the possessors (and tenants) of the lands were bound to have their grain ground at that mill, and to pay as "multure" or duty a certain proportion of the grain ground, varying from $\frac{1}{30}$ to $\frac{1}{12}$ of the corn ground. The possessors of the astricted lands were called suckeners; the multure paid by those who were not bound, but used the mill, was out-sucken multure. Since 1799 this class of local burdens has almost entirely disappeared by commutation, voluntary renunciation, or private agreement. Such a servitude or easement was rare in England.

Thirlmere, a narrow sheet of water in Cumberland co., England, in the heart of the Lake district, lying 533 feet above sea-level, and 3 miles long by ¼ mile wide, between Derwentwater and Grasmere. It was acquired as a water supply by Manchester. The work was begun in 1886, and the entire system was completed in 1894.

Thirlwall, Connop, an English bishop and historian; born in Stepney, Middlesex, England, Jan. 11, 1797; was a child of almost unexampled precocity, learned Latin at three, read Greek at four, and at 11 published "Primitiæ" (1809), a volume of poems and sermons which in later years he did his best to suppress. He next went to Charterhouse, where Grote, Julius Hare, and Henry Havelock were among his schoolfellows; entered Trinity College, Cambridge, in October, 1814, and in February following carried off the Craven scholarship, which only Porson and Professor Kennedy have done as freshmen. That same year he gained the Bell scholarship; in 1818 he graduated as 22d senior optime — there being yet no classical tripos — but his real rank was better marked by the first Chancellor's classical medal. In October he was elected to a Trinity fellowship, and next spent about a year on the Continent, making fast friendship with Bunsen at Rome. He entered as a law student at Lincoln's Inn in February, 1820, and soon after joined the famous debating society that included Mill, Macaulay, Charles Austin, Romilly, the two Bulwers, Samuel Wilberforce, and later Maurice and John Sterling. He was called to the bar in 1825, but the natural bent of his mind prevailed, and in 1827 he took orders. Already in 1825 he had translated Schleiermacher's "Essay on St. Luke" and written an introduction — a remarkable performance for a barrister. His

return to Cambridge was marked by the commencement, in conjunction with his dear friend Julius Hare, of a translation of Niebuhr's "History of Rome" (vol. i. 1828; ii. 1832). Their famous "Philological Museum" (1831–1833) saw only six numbers, but contained some remarkable papers, among them Thirlwall's "On the Irony of Sophocles." Besides all this he took a full share of college and clerical work — the latter at Over, 8 miles from Cambridge. In 1834 he signed the petition in favor of the admission of dissenters to academical degrees, and in May put forth a weighty pamphlet in defense of the measure. Thirlwall pointed out with characteristic plainness the perfunctory nature of the religious education that existed, and expressed the belief that compulsory chapel services were "a hindrance and not a help to the religious life." The master of the college, Dr. Christopher Wordsworth, called on him to resign the assistant-tutorship, which he did at once, though under protest. Almost immediately he was presented by Lord Brougham to the quiet Yorkshire living of Kirby-Underdale. Here he wrote for "Lardner's Cyclopædia" his "History of Greece" (8 vols. 1835–1847; improved ed. 1847–1852).

In 1840 Lord Melbourne raised Thirlwall to the see of St. David's, and within six months thereafter he preached in perfect Welsh. For 34 years he labored with the utmost diligence in his diocese, building churches, parsonages, and schools, and augmenting poor livings (to the extent of $150,000 from his own pocket); and, though he wrote no great work, his 11 "Charges" remain an enduring monument of breadth of view and soundness of judgment in reference to all ecclesiastical controversies of one generation. His "Primary Charge" (1840) was a catholic-spirited apology for the Tractarian party then being vehemently charged against by almost every bishop and archdeacon in England. In later days ("Charges" of 1866 and 1872) he modified greatly his approval of the spirit that animated the new party, but his grave warnings and protests against their Romanizing tendencies rise characteristically into a serenely judicial region far above the heated and vulgar atmosphere of polemical debate. Thirlwall joined in the encyclical letter censuring "Essays and Reviews," but was one of the four bishops who refused to inhibit Bishop Colenso. He supported the Maynooth grant, the admission of Jews to Parliament, and alone among the bishops voted for the disestablishment of the Irish Church, though he would have preferred to see a measure of concurrent endowment. He was appointed chairman of the Old Testament Revision Committee, and resigned his see in May, 1874, retiring to Bath, where he died July 27, 1875.

Thirlwall's massive understanding, vast learning, and fundamental breadth and fairness of mind were a combination of enormous value to the Church of England; and no words of epitaph could have been found better than those inscribed on the granite slab over his grave in Westminster Abbey, where he sleeps side by side with his brother-historian Grote: "*Cor sapiens et intelligens ad discernendum judicium.*" He never married, but lived throughout his life in the midst of his nephews and their children, and his love for cats rivalled Southey's. And few men have left a more pleasing though unconscious monument of noble character than the beautiful series of letters to a young lady — the "Letters to a Friend," edited by Dean Stanley in 1881.

Thirling, in mining, a worked space connecting the rooms of a mine. The rooms are galleries proceeding regularly (in coal mines) from the dip-head or main-level, and the unworked space forms a wall. By cutting gaps in this wall at regular intervals, the wall becomes a row of pillars, the said connecting workings are thirlings.

Thirst, a sensation resulting from a peculiar state of the system, but especially of the mucous membrane of the fauces, usually caused by an insufficient supply of liquid. In cases of extreme thirst there is a peculiar sense of clamminess in the mouth and pharynx, which, with the other disagreeable feelings, is almost immediately relieved by the introduction of liquid into the stomach, where it is absorbed by the veins. That the thirst is relieved by the absorption of the fluid, and not by its action as it passes over the mucous membrane, which seems to suffer most, is proved by the facts (1) that injection of liquids into the stomach through a tube (in cases of wounded œsophagus), and (2) the injection of thin fluids, as water, into the blood, remove the sensation of thirst.

An excessive thirst is often an important morbid symptom. It may arise from two very opposite conditions — one a condition of excitement, and the other of depression. Whenever the blood is in a state requiring dilution, and is too stimulating, as in fevers and inflammations, there is thirst; and, again, in cases of excessive secretion and exhaustion, as for example in cholera and in the two forms of diabetes, there is great thirst, which sometimes also attends the lowest stages of prostration in malignant diseases. When there is a great loss of the watery portion of the blood by profuse perspiration, caused not by disease, but by hard bodily exercise in a hot atmosphere, as in the case of coal heavers, mowers, and reapers, etc., there is always great thirst,

and from two to four gallons of beer or cider a day may, in these cases, be taken with apparent impunity. Cold tea, without milk or sugar, is the most satisfying drink under these circumstances. Independently of disease, great thirst may be induced by the use of salted meat or fish, peppered curries, malt liquors drugged with salt and more pernicious matters, gin strengthened with sulphuric acid, etc.

Thirty-nine Articles. See ARTICLES, THE THIRTY-NINE.

Thirty Tyrants, a body of men of the higher classes who usurped the government of Athens 404-403 B. C. Of these, Critias was the most noted. They were expelled by the democratic party led by Thrasybulus. Also a name given to a number of pretenders to the Roman empire during the reigns of Valerian and Gallienus, A. D. 254-268.

Thirty Years' War (1618 to 1648), a war in Germany, at first a struggle between Roman Catholics and Protestants. Subsequently it lost its religious character and became a struggle for political ascendency in Europe. On the one side were Austria, nearly all the Roman Catholic princes of Germany, and Spain; on the other side were, at different times, the Protestant powers and France. The occasion of this war was found in the fact that Germany had been distracted ever since the Reformation by the mutual jealousy of Catholics, Lutherans, and Calvinists. Certain concessions had been made to the Protestants of Bohemia by Rudolph II. (1609), but these were withdrawn by his successor Matthias in 1614, and four years afterward the Bohemian Protestants were in rebellion. Count Thurn at the head of the insurgents repeatedly routed the imperial troops, compelling them to retire from Bohemia, and (1619) invaded the archduchy of Austria. Matthias having died in 1619, he was succeeded by Ferdinand II., who was a rigid Catholic, but the Protestants elected as their king Frederick, Elector Palatine, who was a Protestant. Efforts at mediation having failed, the Catholic forces of Germany marched against Frederick, who, with an army of Bohemians, Moravians, and Hungarians, kept the field till Nov. 8, 1620, when he was totally routed at Weissenberg, near Prague, by Duke Maximilian of Bavaria. The Protestant cause was now crushed in Bohemia, and the people of that province suffered cruel persecution. The dominions of Frederick, the Palatinate of the Rhine included, were now conquered, the latter being occupied by Count Tilly, assisted by the Spaniards under Spinola. At the Diet of Ratisbon (March, 1623) Frederick was deprived of his territories, Duke Maximilian receiving the Palatinate.

Ferdinand, whose succession to the throne of Bohemia was thus secured, had now a favorable opportunity of concluding a peace, but his continued intolerance toward the Protestants caused them to seek foreign assistance, and a new period of war began. Christian IV. of Denmark, induced partly by religious zeal and partly by the hope of an acquisition of territory, came to the aid of his German coreligionists (1624), and being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony. There they were met by Wallenstein, Duke of Friedland, who in 1626 defeated Mansfeld at Dessau, while Tilly was also successful in driving Christian back to Denmark. In the peace of Lübeck which followed (May, 1629) Christian of Denmark received back all his occupied territory, and undertook not to meddle again in German affairs. After this second success, Ferdinand again roused his people by an edict which required restitution to the Roman Catholic Church of all church lands and property acquired by them since 1552.

To the assistance of the Protestants of Germany, in these circumstances, came Gustavus Adolphus, King of Sweden, who landed (1630) with a small army on the coast of Pomerania. Joined by numerous volunteers, and aided by French money, he advanced, and routed Tilly at Breitenfeld (or the battle of Leipsic, September, 1631), victoriously traversed the Main and the Rhine valleys, defeated Tilly again near the confluence of the Lech and the Danube (April, 1632), and entered Munich. Meanwhile the emperor sought the aid of Wallenstein, by whose ability and energy Gustavus was obliged to retire to Saxony, where he gained the great victory of Lützen (November, 1632), but was himself mortally wounded in the battle. The war was now carried on by the Swedes under the chancellor Oxenstierna, till the rout of the Swedish forces at Nördlingen (September, 1634) again gave to the emperor the preponderating power in Germany. The Elector of Saxony,, who had been an ally of Gustavus, now made peace at Prague (May, 1635), and within a few months the treaty was accepted by many of the German princes.

The Swedes, however, thought it to their interest to continue the war, while France resolved to take a more active part in the conflict. Thus the last stage of the war was a contest of France and Sweden against Austria, in which the Swedish generals gained various successes over the imperial forces, while the French armies fought with varied fortunes in West Germany and on the Rhine. Meanwhile the emperor had died (1637), and had been succeeded by his son, Ferdinand III. The struggle still con-

tinued till in 1646, the united armies of the French under the great generals Turenne and Condé, and the Swedes advanced through Suabia and Bavaria. The combined forces of Sweden, Bavaria, and France were then about to advance on Austria, when the news reached the armies that the peace of Westphalia (1648) was concluded, and that the long struggle was ended.

Thisbe, in classical legend, a Babylonish maiden beloved by Piramus. They lived in contiguous houses, and as their parents would not let them marry, they contrived to converse together through a hole in the garden wall. On one occasion they agreed to meet at Ninus's tomb, and Thisbe, who was first at the spot, hearing a lion roar, ran away in a fright, dropping her garment on the way. The lion seized the garment and tore it. When Piramus arrived and saw the garment, he concluded that a lion had eaten Thisbe, and he stabbed himself. Thisbe, returning to the tomb, saw Piramus dead, and killed herself also. The story is travestied in "The Midsummer Night's Dream," by Shakespeare.

Thistle, the common name of prickly plants of the tribe *Cynaraceæ*, natural order *Compositæ*. There are numerous species, most of which are inhabitants of Europe, as the musk thistle (*Carduus nutans*), milk thistle (*C. Marianus*), welted thistle

STEMLESS THISTLE.

(*C. acanthoides*), slender-flowered thistle (*C. tenuiflorus*), the spear thistle (*Cnicus lanceolatus*), and field thistle (*Cnicus arvensis*), a well-known plant very troublesome to the farmer. The blessed thistle, *Carduus benedictus* of the pharmacopœias, *Cnicus benedictus* or *Cirsium benedictum* of modern botanists, is a native of the Levant, and is a laxative and tonic medicine. The cotton thistle belongs to the genus *Onopordum*. The common cotton thistle (*O. Acanthum*) attains a height of from four to six feet. It is often regarded as the Scotch thistle, but it is doubtful whether the thistle which constitutes the well-known Scotch national badge has any existing type, though the stemless thistle (*Cnicus acaulis* or *Cirsium acaule*) is in many districts of Scotland looked on as the true Scotch thistle. Some dozen species of thistle are common in the United States, spreading from New England to Florida; Canada thistle is one of the severest pests of the farmer, W. and S.

Thistle, Order of the, a Scotch order of knighthood, sometimes called the Order of St. Andrew. It was instituted by James

STAR, COLLAR, AND ST. ANDREW OF THE ORDER OF THE THISTLE.

VII. (James II. of England), in 1687, when eight knights were nominated. It fell into abeyance during the reign of William and Mary, and was revived by Queen Anne in 1703. As at present constituted, the order consists of the British sovereign and knights to the number of 16. The insignia consists of a collar, badge, jewel, star, and ribbon. The collar is composed of golden thistles and leaves connected by crossed sprigs of rue, enameled. The badge is a golden eight-pointed star, whereon is an enameled figure of St. Andrew, bearing in front of him his cross in silver; it is worn attached to the collar. The jewel is worn round the neck with the ribbon. The star is of four points, with a St. Andrew's Cross embroidered in silver upon it. In the center is a green and gold thistle within a circle of green, bearing the motto in golden letters; ribbon, dark green; motto: *Nemo me impune lacessit* (Nobody injures me, with impunity). Besides the knights ordinary, there are extra knights (princes), and a dean, a secretary, the lyon-king-at-arms, and the gentleman usher of the green rod.

Thistle Crown, a gold coin of James VI. of Scotland (James I. of England), of the valuc of 97.3 cents. It bore on the obverse a rose, and on the reverse a thistle, both crowned.

Thistlewood Conspiracy, a conspiracy formed in London in 1820 to assassinate the ministers of the crown at a cabinet dinner, and excite an insurrection in the city, so called from the name of its ringleader, Arthur Thistlewood, a profligate whom ill fortune had rendered desperate. The plot was discovered by a government spy, and the conspirators were seized in a garret in Cato street, Feb. 23, the day fixed on for the execution of the project. Thistlewood and four others were executed May 1, 1820.

Thlaspi, in botany, the pennycress, the typical genus of *Thlaspideæ*. Herbs with rosulate radical and hastate cauline leaves; pod short, laterally compressed, valves winged at the back; cells two to eight seeded. *T. arvense* is the Mithridate mustard, *T. perfoliatum*, the perfoliate, and *T. alpestre*, the Alpine penny cress. The second and third are rare, the first not very common.

Thoburn, Isabelle, an American educator, sister of Bishop Thoburn; born near St. Clairsville, O., March 29, 1840; was graduated at the Female College in Wheeling, W. Va.; and went to India as a missionary in 1869. She founded in Lucknow the first college for women in India, the Harriet Warren Memorial College, which was affiliated in 1891 with the Allahabad University. She died in Lucknow, Sept. 1, 1901.

Thoburn, James Mills, an American clergyman; born in St. Clairsville, O., March 7, 1836; was graduated at Allegheny College in 1857; joined the Pittsburg Conference of the Methodist Episcopal Church in 1858; and engaged in missionary work in India in 1859. He was presiding elder at the India Conference in the United States in 1886–1888, and in the latter year was elected missionary bishop of India and Malaysia. He was author of "My Missionary Apprenticeship in New York"; "Missionary Sermons"; "India and Malaysia"; "Light in the East"; "The Deaconess and Her Vocation"; "Christless Nations"; "The Church of the Pentecost" (1901).

Tholen, an island of the Netherlands, in the province of Zeeland, N. of the Ooster Schelde; area, 51 square miles. It has a rich soil, and is protected by dykes. Wheat, rye, barley, oats, flax, madder, beans, and potatoes are its products. The chief town has the same name.

Tholichthys, in ichthyology, a pseudogenus of teleostean fishes, founded on what are probably immature individuals of the *Cyttidæ, Squamipennes*, etc.

Tholichthys Stage, a stage in the development of certain teleostean fishes, in which the young differ so widely from the adult as in many cases to have been taken for types of distinct genera. The frontal bone is prolonged into a straight lancet-shaped process, nearly half as long as the body; the supra-scapular and præopercular processes cover and hide the dorsal and ventral fins. The plates attached to the shoulder girdle remain persistent till the young fish has assumed the form of the adult.

Tholuck, Friedrich August Gottreu (to-lök), a German theologian; born in Breslau, Prussia, March 30, 1799. His works, most of which have been often reprinted in Germany and translated into English, were published at Gotha in an edition of 11 volumes (1863–1872), and treat of Oriental subjects: "Sufism; or, Pantheistic Theosophy of the Persians" (1821); "The Epistle to the Romans" (1824); "The Gospel of John" (1827; translated into English by Kauffmann, 1836); "The Sermon on the Mount" (1833; translated into English by R. L. Brown, Edinburgh, 1860); "Early History of Rationalism" (4 vols. 1853–1862); "Church Life of the 17th Century" (1861–1862). He died in Halle, Prussia, June 10, 1877.

Thom, James, a Scotch sculptor; born in Ayrshire, Scotland, in 1799. While still an obscure stone cutter, he suddenly became famous by a group representing "Tam o' Shanter and Souter Johnny," and cut in the common sandstone on which he was accustomed to work. It is a miracle of dramatic vigor and artistic skill. This group, which now adorns the Burns Monument at Doon, near Ayr, was first exhibited in Edinburgh in November, 1828. Orders flowed in on the gifted sculptor, who removed to London, whence in 1837 he sailed for the United States, where he settled, and where his genius found a liberal recognition. He died of consumption in New York city, April 17, 1850.

Thom, William, a Scotch poet; born in Aberdeen, Scotland, in 1799. His life is a sad record of unavailing struggles with miserable poverty. Sent to earn his bread in a factory at the age of 10, he became, after a four years' apprenticeship, a weaver in his native town, and worked there for 17 years. Then he removed to Newtyle, in Forfarshire. In 1837 some great failures in the United States caused the stoppage of 6,000 looms in Dundee and the villages round about. Thom was forced to wander about with a young family, houseless and penniless, deriving his only subsistence from his flute. During a dismal expedition through Fife in search of work, one of his children died from want. At last he found

employment at Inverurie. While there he wrote his "Mitherless Bairn," a poem which is instinct with a deep feeling for cheerless misery, and which has drawn tears from the coldest hearts. He died in Hawkhill, near Dundee, Feb. 28, 1848. His poems were collected and published in one volume in 1845.

Thomas, Charles Louis Ambroise (to-mä'), a French musical composer; born in Metz, Germany (then in France), Aug. 5, 1811. He entered the Paris Conservatory in 1828, where he carried off the first prize for piano playing in 1829, for harmony in 1830, following up these two successes by gaining the Grand Prix for musical composition in 1832. Before he had reached the age of 26 Thomas had produced a cantata, a requiem mass for orchestra, and numerous pieces for pianoforte, violin, and orchestra. His first success in opera was with "The Double Ladder" in 1837; followed by "Mina" (1843); "Betty" (1846); "Midsummer Night's Dream" (1850); "The Carnival of Venice" (1853); "The Romance of Elvire" (1860); "Mignon" (1866); "Hamlet" (1868); "Franeesca of Rimini" (1882); with innumerable other operas, cantatas, part songs, and choral scenas. Thomas was appointed a member of the Institute in 1851, Professor of Composition in 1852, and succeeded Auber as director of the Conservatory in 1871. He received the Grand Cross of the Legion of Honor in 1880. He died Feb. 12, 1896.

Thomas, Antoine (tō-mä'), a French philologist; born in St. Irieix-la-Montagne, Franee, Nov. 29, 1857. He was appointed professor in the University of Paris, 1889. His chief works are: "The Provineial Estates of Central France under Charles VII." (1879); "Franeesco of Barberino and Provençal Literature in Italy" (1883).

Thomas, Arthur Goring, an English musieal composer; born near Eastbourne, England, Nov. 21, 1851; was educated for the civil service, but took up the study of music at the Paris Conservatory (1875–1877), and then for three years at the Royal Academy of Music, London, and wrote the operas "Esmeralda" (1883) and "Nadeshda" (1885), the cantata "Sun Worshipers" (1881), and many songs. He died March 21, 1892.

Thomas, Arthur Lloyd, an American banker; born in Chicago, Ill., Aug. 22, 1851; was secretary of the Utah Treasury in 1879–1878; supervisor of the census of Utah in 1880; special government agent to collect Church and school statistics in 1881; and a member of the commission to compile and codify the laws of Utah in 1884. He was a member of the Utah Commission in 1886–1889; governor of Utah in 1889–1893; and in January, 1898, became postmaster of Salt Lake City.

Thomas, Calvin, an American educator; born near Lapeer, Mich., Oct. 28, 1854; was graduated at the University of Michigan in 1874; taught Latin and Greek in the high school of Grand Rapids, Mich., in 1874–1877; was instructor in the University of Michigan in 1878–1881; assistant professor there in 1881–1886, and full Professor of Germanic Languages and Literatures in 1886–1896, when he became Professor of German at Columbia University. His publications include "A Practical German Grammar"; "Goethe and the Conduct of Life"; "Poetry and Science"; "What is Republicanism?"; "Have We Still Need of Poetry"; and several editions of standard German works.

Thomas, Cyrus, an American arehæologist; born in Kingsport, Tenn., July 27, 1825. He practised law till 1865; entered the ministry; in 1869 joined the eorps of the Geologieal Survey under Hayden; became Professor of Natural Seience in the Southern Illinois Normal University in 1873; State entomologist of Illinois in 1875–1882. Besides reports, he wrote: "Study of the Manuscript Troano" (1882); "Notes on Certain Maya and Mexican Manuseripts" (1884); "Mound Exploration" (1888); "Introduetion to American Archæology"; "The Mayan Calendar Systems; etc.

Thomas, Edith Matilda, an American poet; born in Chatham, O., Aug. 12, 1854. She eontributed to many periodicals, and published in book form: "A New Year's Masque," etc. (1885); "The Round Year" (1886); "Lyries and Sonnets" (1887); "Children of the Seasons" Series (1888); "Babes of the Year" (1888); "Babes of the Nations" (1889); "Heaven and Earth" (1889); "The Inverted Torch" (1890); "Fair Shadow Land" (1893); "In Sunshine Land" (1895); "In the Young World" (1895; "A Winter Swallow with Other Verse" (1896).

EDITH M. THOMAS.

Thomas, Frederick William, an American author; born in Charleston, S. C., in

1811. He was Professor of English Literature in the University of Alabama. He contributed much in prose and verse to periodicals, and published: "The Emigrant," poem (1833); "Clinton Bradshaw" (1835); "East and West" (1836); "Howard Pinckney" (1840), novels; "The Becchen Tree, and Other Poems" (1844); "Sketches of Character," etc. (1849); and "John Randolph of Roanoke," etc. (1853). He died in Washington, D. C., Sept. 30, 1866.

Thomas, George Henry, an American military officer; born in Southampton co., Va., July 31, 1816; was graduated at the United States Military Academy in 1836; took part in the Florida War in 1840–1842, and the war with Mexico in 1846–1848; participated in the Seminole campaign in 1849–1850; and served on frontier duty in California and Texas in 1850–1860. At the outbreak of the Civil War he was made a colonel of cavalry and took part in the operations in the Shenandoah valley in the summer of 1861, and later as commander of a division in the Army of the Ohio was actively engaged in the operations in Tennessee and Mississippi. Afterward, under General Rosecrans, as commander of a corps of the Army of the Cumberland, he engaged in the battles of Murfreesboro and Chickamauga, and in 1863, as commander of the Army of the Cumberland, he bore an important part in the battle of Missionary Ridge and in the Atlanta campaign under Sherman. In October, 1864, he was sent to Nashville to oppose the Confederates under Hood, whom he finally defeated before Nashville, Dec. 15, 1864. For his services in these operations he was promoted Major-General; received the thanks of Congress, and was presented with a gold medal by the State of Tennessee. After the war he commanded the Department of the Tennessee; was chief of the 3d Military District, comprising Georgia, Florida, and Alabama, and in 1868 was placed in command of the 4th Military Division, comprising the territory of the Pacific and Alaska, and continued in this capacity till his death, in San Francisco, Cal., March 28, 1870.

Thomas, Isaiah, an American publisher; born in Boston, Mass., Jan. 19, 1749. He established and printed the "Massachusetts Spy," 1770–1801; imported and used the first font of music type; established the "Massachusetts Magazine" (1789–1796); printed noted editions of the Bible and Watts's "Psalms and Hymns"; founded the Antiquarian Society, Worcester, Mass., and endowed it with a library and funds for its maintenance; and was the author and publisher of the "History of Printing." He died in Worcester, Mass., April 4, 1831.

Thomas, Jesse Burgess, an American clergyman; born in Edwardsville, Ill., July 29, 1832; was graduated at Kenyon College in 1850; practised law in Chicago, Ill., in 1857–1862; was ordained in the Baptist Church; pastor of the First Baptist Church, Brooklyn, N. Y., in 1864–1869 and 1874–1888 and of the Michigan Avenue Baptist Church, Chicago, 1869–1874. He accepted the chair of Church history at Newton Theological Institution in 1888. He was the author of "The Old Bible and the New Science"; "The Mould of Doctrine"; and "Significance of the Historical Element in Scripture."

Thomas, John, an American military officer; born in Marshfield, Mass., in 1725; was appointed a surgeon in the army in 1746; served on the medical staff of General Shirley's regiment in 1747; became colonel of provincials in 1759, and in 1760, in command of a regiment under General Amherst, was engaged in operations against the French at Lake Champlain and at Montreal. During the Revolutionary War he raised a regiment of volunteers and was appointed Brigadier-General; took part in the siege of Boston; forced the British to evacuate Dorchester; and participated in the Canadian campaign. He died in Chambly, Canada, June 2, 1776.

Thomas, John, an Anglo-American religious leader; born in London, April 12, 1805. He was educated in that city, where he became demonstrator of anatomy in St. Thomas's Hospital. In 1832 he came to the United States, and soon after he connected himself with the Disciples of Christ (*q. v.*). Years later he left that denomination and founded the sect called Christadelphians (*q. v.*). Returning to England, he lectured in its interest and made converts. He edited the "Apostolic Advocate" (1832-37), the "Herald of the Future Age" (1845-47), and the "Herald of the Kingdom" (1851-61), and published "Elpis," "Israel," "Eureka," etc. He died March 5, 1871.

Thomas, John Robert, an American jurist; born in Mt. Vernon, Ill., Oct. 11, 1846; received an academic education. He enlisted as a private in the Union army during the Civil War and was promoted to captain. He was State attorney of Illinois for four years and held a seat in Congress in 1879–1889, serving as a member of the Committee on Naval Affairs. Owing to his interest in the new navy he was called the "father of the modern American navy." In 1897 he was made judge of the United States Court for the Indian Territory.

Thomas, John R., an American song writer; born in Newport, Wales, in 1830;

Thomas

came to the United States at an early age, taught music, and sang in opera and oratorio. His songs were highly popular. Among the best known are: "Cottage by the Sea"; "Happy Be Thy Dreams"; "Some One to Love"; "'Tis but a Little Faded Flower"; "Beautiful Isle of the Sea"; "The Flag of the Free"; "The Mother's Prayer"; and "No Crown Without the Cross." He died in 1896.

Thomas, Joseph, an American lexicographer; born in Cayuga co., N. Y., Sept. 23, 1811. He was with Thomas Baldwin, author of "Baldwin's Pronouncing Gazetteer." In 1851–1852 appeared his first book of "Etymology," followed by an edition of Oswald's "Etymological Dictionary." In 1854 he prepared "A New and Complete Gazetteer of the United States"; and in 1855 "A Complete Geographical Dictionary of the World" (popularly known as "Lippincott's Gazetteer of the World"), containing a notice of the pronunciation of the names of nearly 100,000 places, and which for accuracy and completeness has scarcely an equal. In 1864 appeared his comprehensive "Medical Dictionary"; and in 1870 his "Universal Pronouncing Dictionary of Biography and Mythology," which occupies a high place among books of reference. He died in Philadelphia, Pa., Dec. 24, 1891.

Thomas, Lewis Foulke, an American poet; born in Baltimore, Md., in 1815. He was author of "India and Other Poems" (St. Louis, 1842), the first book of poetry published W. of the Mississippi; and the tragedies "Osceola," successfully performed in Cincinnati (1838), and "Cortez" (Washington, 1857). He died in Washington, D. C., May 26, 1868.

Thomas, M. Carey, an American educator; born in Baltimore, Md., Jan. 2, 1857; was graduated at Cornell University in 1877; studied at Johns Hopkins University in 1877–1878, and in Germany in 1879–1883; and in 1885 became Professor of English at Bryn Mawr College. In 1894 she was made president of the institution, and in 1895–1899 was also a member of the board of trustees of Cornell University. Her publications include "Sir Gawayne and the Green Knight"; "Education for Women"; and several educational addresses; etc.

Thomas, Thaddeus Peter, an American educator; born in Russell co., Va., May 19, 1867; was graduated at the University of Tennessee in 1885 and pursued post-graduate studies in economics and history at Vanderbilt and Johns Hopkins Universities. He was an instructor in the public schools of Knoxville, Tenn., in 1885–1888 and in the high school of Union City, Tenn., in 1888–1890. He was associate Professor of Sociology and History at the Woman's College of Baltimore in 1895–1899, and in the latter year was made full professor. His publications include "The City Government of Baltimore."

Thomas, Theodore, a German-American musician; born in Esens, Hanover, Germany, Oct. 11, 1835. He first played in public at the age of six. In 1845 his family removed to the United States, and for two years he played violin solos at concerts in New York. He then traveled for a time in the South, and returning to New York in 1851, he played at concerts and at the opera; at first as one of the principal violinists, and afterward as orchestral leader, till 1861. In connection with others he began a series of chamber concerts in 1855, which were continued till 1869. His first symphony concerts were given in 1864–1865, and extended (excepting from 1869 to 1872) till he left New York, in 1878, to take the direction of the College of Music at Cincinnati. He remained in Cincinnati till 1880, when he resigned this position and returned to New York. With brief intervals he was conductor of the Brooklyn Philharmonic Society from 1862–1891, and of the New York Philharmonic Society from 1877–1891. From 1866 to 1878 he gave a series of summer concerts nightly in various cities; and in 1869 he made his first concert tour in the Eastern and Western States, which he repeated from time to time afterward. He conducted five music festivals in Cincinnati (1873, 1875, 1878, 1880, and 1882), one in Chicago (1882), and one in New York (1882). In the winter of 1885–1886 he organized a series of popular concerts in New York, and in the same season he became the conductor of the newly-established American Opera, holding that position for two years. In 1891 established his orchestra permanently at the Auditorium in Chicago. In 1893 he was musical director at the World's Fair, till Aug. 10, when he resigned. He visited New York with his orchestra in 1895 and 1897.

Thomas, Theodore Gaillard, an American physician; born in Charleston, S. C., Nov. 21, 1831; was graduated at the Medical College at Charleston in 1852. He was resident physician of Bellevue and Ward's Island hospitals, New York city, and also Professor of Gynæcology and Obstetrics at the College of Physicians and Surgeons, New York city, for many years. He was the author of "Diseases of Women" (7th ed. 1868), which has been translated into German, French, Spanish, Italian, and Chinese. He also was one of the authors of "A Century of American Medicine" (1876). He died Feb. 28, 1903.

Thomas, William Davy, an American educator; born Jan. 5, 1844; was graduated at Princeton College in 1870 and at the Union Theological Seminary, New York city, in 1873; studied abroad in 1874–1875; was ordained in the Presbyterian Church and for some time was pastor of the First Presbyterian Church in La Crosse, Wis. Subsequently he was made superintendent of the missions of the Presbyterian Church in the United States; became Professor of Mental and Moral Science at Gale College, and afterward its president. He was the author of "Philosophical Articles in Criticism of Herbert Spencer," "Articles on Agnosticism," etc.

Thomas, William Widgery, Jr., an American diplomatist; born in Portland, Me., Aug. 26, 1839; was graduated at Bowdoin College in 1860; and began his diplomatic career as United States bearer of dispatches in 1862. Later he became successively vice-consul-general at Constantinople; acting consul at Galatz, Moldavia; and consul at Gothenburg, Sweden. On his return to the United States in 1866 he was admitted to the bar, and in 1869 was appointed commissioner of public lands in Maine. He was commissioner of immigration for that State in 1870; member of the Legislature in 1873–1875; delegate to the National Republican Convention in 1880; United States minister to Norway and Sweden in 1883–1885 and in 1889–1894; and was again appointed to that office in 1897.

Thomas à Kempis. See KEMPIS.

Thomas Aquinas. See AQUINAS, THOMAS.

Thomas of London. See BECKET, THOMAS A.

Thomas, St., called Sydamus, or the twin (this being the meaning of both forms of his name), one of the 12 apostles of Jesus Christ. He is presumed to have been a native of Galilee. He is distinguished in sacred history by his disbelief of the resurrection of his master; on which Jesus vouchsafed to permit him to put his fingers into His wounds, and Thomas exclaimed, "My Lord and my God!" He is supposed to have suffered martyrdom in Coromandel, India, where there are still Christian churches which are called by his name. Efforts have been made by the Roman Catholic theologians of Spanish America to prove that the apostle visited the Western Continent and that he was the person afterward worshiped as Quetzalcoatl. See CHRISTIANS OF ST. THOMAS.

Thomasius, Christian, a German author; born in Leipsic, Germany, Jan. 1, 1655, studied at Frankfort-in-the-Oder (1675–1679); returned to his native town and lectured on law. In 1687 he adopted the German language in place of the Latin, as the vehicle of his expositions, published his programme for the following year in the same tongue, and commenced an unconventional monthly journal. But this work and his advanced views on theological subjects excited so much opposition that he was forced to leave Leipsic, and went first to Berlin, and afterward (1690) to Halle, where, under the patronage of the Brandenburg court, his lectures were the means of establishing a university, since famous. In this university Thomasius became Professor of Jurisprudence. He broke away completely from traditional pedantry and mediæval terminology, introduced better methods into the scientific treatment of various departments of study, and was a courageous opponent of trial for witchcraft and the use of torture. His specialty was international law (*jus naturale*) and ethics. He wrote "Thoughts and Reminiscences" (1723–1726); and "History of Wisdom and Folly" (1693). He died in Halle, Sept. 23, 1728.

CHRISTIAN THOMASIUS.

Thomasius, Gottfried, a German theological writer; born in Egenhausen, Franconia, Germany, July 26, 1802; became Professor of Dogmatics at Erlangen. Among his writings are: "Origen" (1837); "Contributions to Christology" (1845); "The Person and the Work of Chist" (1852); "Resuscitation of Evangelical Life in the Lutheran Church of Bavaria" (1867); "History of Christian Dogma" (1874). He died in Erlangen, Jan. 24, 1875.

Thomas of Aquino. See AQUINAS, THOMAS.

Thomas of Celano, an Italian hymnologist; born in Celano, in the Abruzzi, Italy; was one of the first disciples of St. Francis. He is probably the author of the "Dies Iræ." He is also believed to have written the biography of St. Francis found in the Bollandists' "Acta Sanctorum." He died about 1255.

Thomasville, a city and county-seat of Thomas co., Ga.; on the Plant System railroad; 32 miles N. E. of Tallahassee, Fla.

Here are a court house, Young Female College, the Fletcher Institute for Boys, South Georgia College, the Connecticut Industrial School for Colored Pupils, waterworks, electric lights, National and State banks, and several newspapers. It is a noted winter health resort. The city has iron foundries and machine shops. Pop. (1890) 5,514; (1900) 5,322; (1910) 6,727.

Thomism, in Church history, one of the two great schools of scholasticism, the other being SCOTISM (*q. v.*). It derived its name from its founder, St. Thomas Aquinas (1227–1274), the great Dominican doctor. In theology Thomism followed the doctrines of Augustine as to free will and grace, and held that the Virgin Mary was sanctified after her body was informed by the soul; its philosophy was a moderate Realism. As

Thompson, Almon Harris, an American geographer; born in Stodard, N. H., Sept. 24, 1839; was educated at Wheaton (Ill.), College; served with credit during the Civil War and afterward became superintendent of schools of Lacon, Ill. He was superintendent of schools of Bloomington, Ill., in 1867–1868; acting curator of the Illinois Natural History Society in 1869–1870; employed in the exploration of the Colorado river of the West in charge of the geographic work in 1870–1878; and was director of the topographic department of the United States Geological Survey, W. of the Mississippi river, in 1884–1895. He was appointed geographer of the United States Geological Survey in 1882. D. 1906.

Thompson, Augustus Charles, an American clergyman; born in Goshen, Conn., April 30, 1812; was educated at Yale University and graduated at the Hartford Theological Seminary in 1838; studied abroad in 1838–1839; was ordained in the Congregational Church, became pastor of the Eliot Congregational Church, Roxbury, Mass., in 1842. He was a delegate to the Mildmay Missionary Conference in 1878 and the London Missionary Conference in 1888. His publications include "Better Land" (1855); "Morning Hours in Patmos" (1860); "The Mercy Seat" (1863); "Seeds and Sheaves" (1869); "Moravian Missions" (1882); "Foreign Missions" (1889); "Protestant Missions" (1894); "Eliot Memorial" (1900); etc. D. 1901.

Thompson, Benjamin, See RUMFORD, BENJAMIN THOMPSON, COUNT.

Thompson, Charles Lemuel, an American clergyman; born in Allentown, Pa., Aug. 18, 1839; was educated at Carrol College, Wis., and Princeton and McCormick Seminaries, and ordained in the Presbyterian Church in 1861. He was editor of "The Interior," Chicago, in 1877–1879, and held pastorates in Cincinnati, Chicago, Pittsburg, Kansas City, and New York city, resigning from the latter charge in March, 1898, to become Secretary of the Presbyterian Board of Home Missions. In 1888 he was elected Moderator of the Centennial General Assembly of the Presbyterian Church. He wrote "History of American Revivals"; "Etchings in Verse"; etc.

Thompson, Charles Miner, an American journalist; born in Montpelier, Vt., March 24, 1864; was graduated at Harvard College in 1886; was literary editor of the Boston "Advertiser" (1887–1890); associate editor of the "Youth's Companion" after 1890. He has written: "The Nimble Dollar"; "Life of Ethan Allen"; etc.

Thompson, Daniel Greenleaf, an American author; born in Montpelier, Vt., Feb. 9, 1850; was graduated at Amherst College in 1869; taught for three years, and was admitted to the New York bar in 1872. Thereafter he practised his profession in New York, while his leisure hours were devoted to literary pursuits, lecturing, etc. He made notable contributions to many periodicals; was the author of several books; and an active member of many literary and social clubs and societies. He died in New York city, July 10, 1897.

Thompson, Denman, an American actor; born in Girard, Pa., in 1833; began his professional career as a dancer, Irish character and general utility man. Later he starred in the comedy "Joshua Whitcomb" a play of his own, which was afterward remodeled and presented under the title "The Old Homestead."

Thompson, Elizabeth, an American philanthropist; born in Lyndon, Vt., Feb. 21, 1821; was married to Thomas Thompson, a Boston millionaire in 1845, and on his death in 1869 fell heir to the whole income of his immense estate. She gave large sums to the cause of temperance; published a statistical tract "Figures of Hell" which was widely circulated; distributed more than $100,000 toward establishing heads of families in business; founded the town of Long Mont, Kas., giving 640 acres of land and $300 to each colonist; and contributed largely to the purchase of the Vassar College telescope. She presented Frank B. Carpenter's painting of the "Signing of the Emancipation Proclamation by President Lincoln in the presence of his cabinet." to Congress; donated $1,000 to the American Association for the Advancement of Science in 1883, and in 1885 placed in the hands of a board of trustees $25,000 to be devoted to scientific research. She died in Littleton, N. H., July 20, 1899.

Thompson, Elizabeth Southerden, Lady Butler. See BUTLER, SIR WILLIAM FRANCIS.

Thompson, Francis, an English poet; son of a Lancashire physician; born about 1860; educated at Ushaw College, near Durham, and studied medicine at Owens College, Manchester. His publications include: "Poems" (1893); "Sister Songs" (1895); "New Poems" (1897).

Thompson, George, an English abolitionist; born in Liverpool, June 18, 1804; early became interested in the cause of anti-slavery, and in 1833 became influential as a lecturer in advocy of emancipation in the British colonies. As a member of the Anti-Corn-Law League he assisted in furthering the work of Cobden and Bright. He also did much toward accomplishing the abolition of the apprenticeship system, which had suffered in Great Britain through many abuses. When the British India Association was organized he gave it his support in securing reforms in the Indian government. In 1834 he visited the United States, where he engaged actively with the American abolitionists in their work of agitation. Through his coöperation, in the face of angry opposition and personal peril, the organization of the anti-slavery movement was greatly strengthened. From 1847 to 1852 he was a member of Parliament for the Tower Hamlets district, London. He died Oct. 7, 1878.

Thompson, Sir Henry, an English surgeon; born in Framlingham, England, Aug. 6, 1820; was educated at University College, London; appointed surgeon of the University College Hospital (1863); Professor of Chemical Surgery (1866), consulting surgeon (1874). In 1884, he was made Professor of Surgery and Pathology in the Royal College of Surgeons, London. He was surgeon extraordinary to Leopold I., King of Belgium (1864) and to Leopold II. (1866); and was knighted in 1867. He was the first medical man in England to bring the subject of cremation before the public, and was president of the Cremation Society of London from its organization in 1874. He wrote many medical works, several of which have been translated into the chief languages of Europe. He is also known as a painter, having exhibited at the Royal Academy, London, and the Salon, Paris. Among his works are "Pathology and Treatment of Stricture of the Urethra" (1886); "Practical Lithotrity and Lithotomy" (1863); "Tumors of the Bladder" (1884); "Calculus Disease" (1888); "Modern Cremation, its History and Practice" (1889); two novels, "Charley Kingston's Aunt" (1885), and "All But" (1886). He died April 18, 1904.

Thompson, Henry Adams, an American educator; born in Stormstown, Pa., March 23, 1837; was graduated at Jefferson College in 1858, studied at the Western Theological Seminary; was ordained in the United Brethren Church; Professor of Mathematics at Western College, Iowa, in 1861-1862, and of the same at Otterbein University in 1862-1867. He was president of the latter institution in 1872-1886. He was the Prohibition candidate for governor of Ohio in 1877, and was nominated for vice-president on the ticket with Neal Dow in 1880. He was editor-in-chief of the Sunday-school literature of the United Brethren Church in 1897-1901, then became editor of the "United Brethren Review." His publications include: "Schools of the Prophets," "Power of the Invisible," etc.

Thompson, Hugh Miller, an American clergyman; born in County Londonderry, Ireland, June 5, 1830; was graduated at the Nashotah Theological Seminary, Wis., in 1852; was ordained in the Protestant Episcopal Church in 1856, and was Professor of Church History at the Nashotah Theological Seminary and editor of the "American Churchman," Chicago, in 1860-1870. He held the rectorship of Christ Church, New York city, in 1871-1875, and that of Trinity, New Orleans, in 1876-1883. He was consecrated Bishop of Mississippi in 1887. Dr. Thompson was the author of "Unity and Its Restoration"; "Sin and Penalty"; "First Principles"; etc. He died in 1902.

Thompson, Jacob, an American politician; born in Caswell co., N. C., May 15, 1810; was graduated at the University of North Carolina in 1831; studied law, and in 1835 began to practice in Mississippi. In 1839-1851, he was a member of Congress, and in 1857 became Secretary of the Interior, resigning in 1861. He was active in the secession movement, served in the Confederate army, was governor of Mississippi in 1862-1864, and in the latter year went as Confederate commissioner to Canada. Charged with complicity in the assassination of President Lincoln, he fled to Europe, but returned to the United States, and was never tried. He died March 24, 1885.

Thompson, (James) Maurice, an American author; born in Fairfield, Ind., Sept. 9, 1844. He was a Confederate soldier in the Civil War; afterward State geologist of Indiana, 1885-1889. He wrote nature studies. He published in book form: "Hoosier Mosaics" (1875); "The Witchery of Archery" (1878); "A Tallahassee Girl" (1882), a book which made Tallahassee a popular winter resort; "His Second Campaign" (1883); "Songs of Fair Weather" (1883); "At Love's Extremes" (1885); "Byways and Bird Notes" (1885); "The Boy's Book of Sports" (1886); "A Banker of Bankersville" (1886); "Sylvan Secrets" (1887); "A Fortnight of Folly" (1888); "The Story of Louisiana" (1888); "Poems" (1892); "King of Honey Island" (1892); "The Ethics of Literary Art" (1893); "The Ocala Boy" (1895); "Alice of Old Vincennes" (1900). He died Feb. 15, 1901.

Thompson, John Polk, an American inventor; born in Glasgow, Scotland, in 1838; came to the United States in 1848, and assumed charge of the Sprague Cotton Mill in Baltic, Conn., in 1864. Subsequently he was president of the Voluntown, Robeson and other cotton mills, and invented 14 distinct mechanical devices, each of which produced a radical improvement in methods of carding, stop and let-off motions, and self-threading shuttles. He died in Olneyville, R. I., Sept. 16, 1899.

Thompson, Sir John Sparrow David, a Canadian jurist; born in Halifax, Nova Scotia, Nov. 10, 1844; was called to the bar in 1865; elected to the executive council and to the office of attorney-general of Nova Scotia in 1878; appointed queen's counsellor in 1879 and judge of the Supreme Court in 1882; and in 1895 became minister of justice and attorney-general of Canada. He was a member of the Provincial Assembly of Nova Scotia in 1877–1882; was elected to the Dominion Parliament in 1885, 1887, and 1891; was attached to the British Fishery Commission at Washington, D. C., in 1887; represented Great Britain before the Bering Sea Arbitration Tribunal, in Paris in 1893; and in 1894 was made a member of the Queen's Privy Council. He died in Windsor, England, Dec. 12, 1894.

Thompson, Launt, an American sculptor; born in Abbeyleix, Ireland, Feb. 8, 1833; went to Albany, N. Y., in 1847, and there entered the office of a professor of anatomy. Later he studied sculpture under Erastus D. Palmer, produced several portrait busts and ideal heads of merit, and in 1850 removed to New York city where he became an associate of the Academy of Design in 1859; an academician in 1862; and vice-president in 1874. After traveling in Italy for several years he returned to New York and thereafter devoted himself to his art work. His productions include a bust entitled "Elaine"; "Morning Glory," a medallion; statues of Abraham Pierson at New Haven, Conn., and of Winfield Scott, at Washington, D. C.; portrait busts of William C. Bryant in the Metropolitan Museum New York city, Edwin Booth as Hamlet, Samuel F. B. Morse, etc. Died Sept. 26, 1894.

Thompson, Mortimer M., pseudonym "Q. K. PHILANDER DOESTICKS, P. B., an American humorist; born in Riga, N. Y., Sept. 2, 1830. He contributed at first to the daily and in later years regularly to the weekly newspapers, and published in book form in 1855–1857: "Doestocks: What He Says"; "Plu-Ri-Bus-Tah," a travesty of "Hiawatha"; "The Witches of New York"; "Nothing to Say"; "The Elephant Club." He died in New York city, June 25, 1875.

Thompson

Thompson, Richard Wigginton, an American lawyer; born in Culpeper co., Va., June 9, 1809; removed to Indiana, and was admitted to the bar there in 1834. The same year he was elected to the legislature, serving two terms; was a presidential elector on the Harrison and Tyler ticket; and in 1841 was elected to Congress. In 1843 he began to practise law in Terre Haute, was reëlected to Congress in 1847; and during the Civil War had charge of a recruiting post near Terre Haute and was provost marshal of the district. In 1877, he became Secretary of the Navy, but retired in 1881 to become chairman of the American Committee of the Panama Canal Company. His publications include: "The Papacy and the Civil Power"; "The History of the Protective Tariff"; "Footprints of the Jesuits"; "Recollections of Sixteen Presidents, From Washington to Lincoln," etc. He died in Terre Haute, Ind., Feb. 9, 1900.

Thompson, Robert Ellis, an American educator; born near Lurgan, Ireland, April 5, 1844; was graduated at the University of Pennsylvania in 1865 and ordained to the Presbyterian ministry in 1874. He was Professor of Latin and Mathematics in the University of Pennsylvania in 1868–1871, of Social Science there in 1871–1881, and of History and English in 1881–1892. He lectured on protective tariff at Harvard University in 1885, at Yale in 1886–1887, and on theology at the Princeton Theological Seminary in 1891. He was editor of the "Pennsylvania Monthly" in 1870–1881, and of the "American Weekly" in 1881–1892; was on the staff of the "Sunday-School Times," and in 1894 was chosen president of the Central High School of Philadelphia. His publications include "Social Science and National Economy"; "Protection to Home Industry"; "History of the Presbyterian Churches of America"; "De Civitate Dei"; etc.

Thompson, Vance, an American author; born in Cincinnati, O., April 17, 1863; was graduated at Princeton University in 1883; studied at the University of Jena, Germany, and was a dramatic critic in New York city in 1890–1897. He was the editor and founder of "M'lle New York," and wrote "Berwyn Kennedy" "The City of Torches"; "A Flash of Honor"; "Writers of Young France"; "Killing the Mandarin"; "The Carnival of Destiny"; etc., besides a number of plays and pantomimes.

Thompson, Will L., an American songwriter; born in Beaver co., Pa., Nov. 7, 1847; was educated at the Boston Musical School and the Boston Conservatory of Music in 1870–1875 and later studied in Germany, where he was graduated at the Leipsic Conservatory of Music. His works include "Thompson's Class and Concert";

"Thompson's Popular Anthems"; about 100 popular songs, sueh as "Gathering Shells on the Sea Shore"; "Drifting with the Tide"; "Come Where the Lilies Bloom"; and contributions to almost every hymnal and gospel song collection published in the United States. His "Softly and Tenderly Jesus is Calling" has had a world-wide publication. He died Sept. 20, 1909.

Thompson, William Hepworth, an English classical scholar; born in York, England, March 27, 1810; studied at Trinity College, Cambridge; became Regius Professor of Greek in 1853; and in 1866 succeeded Whewell as master of his college. He projected a great edition of Plato, but accomplished only the "Phædrus" and "Gorgias," He died Oct. 1, 1886.

Thompson, William Oxley, an American educator; born in Cambridge, O., Nov. 5, 1855; was graduated at Muskingum College in 1878, and at the Western Theological Seminary in Allegheny City, Pa., in 1882. He was ordained to the Presbyterian ministry in the latter year; held pastorates in Odebolt, Ia., in 1882–1885; and in Longmont, Col., in 1885–1891; was president of Miami University in Oxford, O., in 1891–1899; and on July 13, 1899, was chosen president of the Ohio State University.

Thompson, Wordsworth, an American artist; born in Baltimore, Md., May 26, 1840; began the study of art in Paris in 1861, and in the following year became a pupil of Charles Gleyre. In 1868 he came to the United States; settled in New York city, and in 1873, sent to the National Academy a picture entitled "Desolation," which secured his election as academician in 1875. In 1878 he became a member of the Society of American Artists, sending to the first exhibition a picture entitled The Road to the Sawmill." He was a constant exhibitor at the national Academy throughout his life and his pictures, which dealt chiefly with Oriental and American historical scenes, attracted considerable attention. He died in Summit, N. J., Aug. 28, 1896.

Thompson-Seton, Ernest, an American author and artist; born in South Shields, England, Aug. 14, 1860; lived in the backwoods of Canada in 1866–1870, and on the Western plains in 1882–1887; was educated at the Toronoto Collegiate Institute and Royal Academy, London; became official naturalist to the government of Manitoba; studied art in Paris in 1890–1896; was one of the chief illustrators of the "Century Dictionary" and author and illustrator of "Wild Animals I have Known," "The Biography of a Grizzly," "The Trail of the Sandhill Stag," "Wild Animal Play for Children," "Lives of the Hunted," etc., and became a popular lecturer on wild animal life. In December, 1901, his name was legally changed from Seton-Thompson to Thompson-Seton.

Thoms, William John, an English author; born in Westminster, England, Nov. 16, 1803. He began life as a clerk in the Chelsea Hospital; later was elerk to the House of Lords, and its deputy-librarian in 1863–1882; was secretary of the Camden Society from 1838 till 1873; founder of "Notes and Queries" (1849), and its editor down to 1872. He gave the name ("Athenæum," August, 1846) to the new subject of study, "folklore." His books include: "A Collection of Early Prose Romances" (3 vols. 1828; enlarged ed. 1858); "Lays and Legends of Various Nations" (4 vols. 1834); "Book of the Court" (1838); "Anecdotes and Traditions illustrative of Early English History and Literature" (Camden Soc. 1838); "Three Notelets on Shakespeare" (1864); "Hannah Lightfoot, Queen Charlotte, and Chevalier D'Eon" (1867); "Human Longevity: its Facts and its Fictions" (1873); besides a translation of Worsaae's "Primeval Antiquities of Denmark" (1849); and an edition of Stow's "Survey of London" (1875). He died in London, Aug. 15, 1885.

Thomsen, Vilhelm Ludvig Peder, a Danish philologist; born in Copenhagen, Denmark, Jan. 25, 1842. His principal works are: "The Magyar Language" (1866); "Influence of the Germanic Languages on the Finno-Lappish" (1870); "Relations between Ancient Russia and Scandinavia" (1879); "Relations between the Finnish and the Baltic Languages" (1890).

Thomsenolite (after Dr. Julius Thomsen, of Copenhagen), a mineral resulting from the alteration of cryolite. Crystallization monoclinic, occurring in prisms with horizontal striæ, and also massive resembling chalcedony; hardness, 2.5–4; sp. gr. 2.74–2.76; luster, vitreous, on some faces pearly; color, white; transparent to translucent. Composition: Fluorine 52.2; aluminum, 15.0; calcium, 15.4; sodium, 7.6; water, 9.8 = 100, which is equivalent to the hitherto accepted formula, $2(CaNa)F + Al_2F_3 + 2HO$; but Brandl has shown that the formula should be written $[NaCa]\ F_3 + Al_2F_6 + H_2O$.

Thomson, Sir Charles Wyville, a Scotch biologist; born in Bonsyde, Scotland, March 5, 1830; was educated at the University of Edinburgh; and became Professor of Mineralogy and Geology in Queen's College Belfast, in 1854. In the dredging expeditions of the "Lightning" and "Porcupine" (1868–1869) he took part, afterward publishing in "The Depths of the Sea" (1869) the substance of his discoveries in regard to the fauna of the Atlantic. In 1869 he became fellow of the Royal Society; in 1870 Professor of Natural History in the Univer-

Thomson

sity of Edinburgh. In 1872 he was appointed scientific chief of the "Challenger" expedition, which was absent from England over three years, during which time 68,800 miles were surveyed. On his return he was knighted, and intrusted by the government with the task of drawing up a report on the natural history specimens collected during the expedition. But he only lived to publish a preliminary account of the expedition, "The Voyage of the 'Challenger'" (1877). He died in Edinburgh, March 10, 1882.

Thomson, Edward William, an American author; born in Toronto, Canada, Feb. 12, 1849. He served in the Union army during the Civil War; returned to Canada; became an engineer and then a journalist. He wrote: "Old Man Savarin, and Other Stories"; "Walter Gibbs," a book for boys; "Between Earth and Sky"; also the metrical portions of M. S. Henry's version of "Aucassin and Nicolette."

Thomson, Elihu, an American electrician; born in Manchester, England, March 29, 1853; came to the United States; was graduated at the Central High School of Philadelphia in 1870, and taught there as Professor of Chemistry and Mechanics in 1870–1880. In the latter year he resigned to enter the Thomas-Houston and General Electric Companies. Subsequently he secured more than 500 patents for inventions which included the Thomson method of electric welding. He was awarded the Grand Prix, in Paris, in 1889 for electrical inventions, received the decoration of Chevalier of the Legion of Honor, for electrical research, etc.; was a trustee of the Peabody Academy of Science in Salem, Mass., a member of the Corporation of the Massachusetts Institute of Technology in Boston, Mass.; and a member of many American and foreign electrical engineering and scientific societies.

Thomson, Frank, an American engineer; born in Chambersburg, Pa., July 5, 1841; spent four years in the Altoona shops of the Pennsylvania railroad; where he became an expert mechanical engineer, and during the Civil War rendered valuable assistance, as 2d assistant secretary of war, in the construction of bridges and railroads, and in the management of the transportation of troops. He was appointed superintendent of the Eastern Division of the Philadelphia and Erie Railroad in June, 1864; general manager of the department of motive power of the Pennsylvania railroad in 1873; and a year later (July 1, 1874), relinquished that office to become general manager of the Pennsylvania railroad system, E. of Pittsburg and Erie. He there introduced substantial reforms in the management and maintenance of the road, and on Oct. 1, 1882, became 2d vice-president; in 1888 1st vice-president and on Feb. 3, 1897, elected president of the Pennsylvania railroad company. He died in Merion, Pa., June 5, 1899.

Thomson, George, a Scotch song collector; born in Limekilns, Scotland, March 4, 1757; was educated at Banff; removed to Edinburgh, where he was secretary to the "Board of Trustees for the Encouragement of Arts and Manufactures" (1780–1830). In 1792 he formed the idea of collecting every existing Scotch melody, and of giving to the world "all the fine airs both of the plaintive and lively kind." The result appeared in six volumes of Scotch songs, followed by two of Irish songs, and three of Welsh melodies. A large number of well-known authors were engaged to supply words to the melodies — among them Thomas Campbell, Professor Smyth, Sir Walter Scott, and Joanna Baillie — but the most prolific writer was the poet Burns, who contributed over 120 songs to the collection. Besides the pianoforte accompaniment, according to Thomson's arrangement, each song was to have a prelude and coda, with accompaniments for violin, flute, and violoncello. For this portion of the work, Thomson secured the services of Pleyel, Kozeluch, Haydn, Beethoven (who received $2,750 for his share of the work), Mozart, Weber, Hummel, Hogarth, and Bishop. The first volume was published three years after the death of Burns. He died in Leith, Scotland, Feb. 18, 1851.

Thomson, James, a Scotch poet; born in Ednam, Scotland, Sept. 11, 1700. He was educated at Jedburgh School and Edinburgh University, and studied for the ministry. In 1725 he went to London and became a tutor. In 1733 he held a position in the Court of Chancery, and on losing this position was given a pension. In 1744 he was appointed surveyor-general of the Leeward Islands. His most famous poem is "The Seasons" (1726–1730), and next to this "The Castle of Indolence" (1748). He wrote some plays, among them being "Sophonisba" (1730) and "Tancred and Sigismunda" (1745). He died near Richmond, England, Aug. 27, 1748.

JAMES THOMSON.

Thomson, James, a Scotch author called "The Poet of Despair"; born in Port Glasgow, Scotland, Nov. 23, 1834. He was brought up in an orphan asylum, and became an army tutor. Most of his life was spent in journalism, though he came to America at one time to investigate a silver mine; thence he was sent to Spain as special correspondent of the New York "World." He suffered much from insomnia, which he made the subject of a powerful poem by that name; and died a victim to the drugs he used to relieve it. His best-known work is "The City of Dreadful Night" (1870–1874); others of high quality are: "The Doom of a City" (1857), and "Our Ladies of Death" (1861). He died in London, England, June 3, 1882.

Thomson, John, a Scotch landscape painter; born in Dailly, Ayrshire, Scotland, in Sept. 1, 1778; succeeded his father as a minister of that parish in 1800, and exchanged that living for Duddingston, near Edinburgh, in 1805. Thomson early turned his attention to art and produced a large number of landscapes. In 1830 he was made a member of the Royal Scottish Academy. He died in Duddingston, Scotland, Oct. 27, 1840.

Thomson, Joseph, an English explorer; born in Penpont, Scotland, Feb. 2, 1858; was educated at Edinburgh. When 20 years of age he accompanied Keith Johnston to Central Africa, assuming full charge of the expedition on the death of Mr. Johnston. In 1882 he explored the Rovuma river in East Africa, and in 1884 made an important journey through Masai Land, in East Equatorial Africa. Among his other achievements are an expedition to the Atlas Mountains, and one to the river Niger. He published: "Through Masai Land," "To the Central African Lakes and Back," "Travels in the Atlas, and Southern Morocco," "Life of Mungo Park," etc. He died in London, Aug. 2, 1895.

Thomson, Thomas, a Scotch chemist; born in Crieff, Scotland, April 12, 1773. He adopted the medical profession, and embraced chemistry as a specialty. In 1802 he published the first edition of his "System of Chemistry," which obtained rapid success both in Great Britain and on the Continent. It was followed in 1810 by his "Elements of Chemistry," and in 1812 by his "History of the Royal Society." In 1813 he went to London and commenced there a scientific journal, the "Annals of Philosophy," which he continued to edit till the end of 1820. The lectureship (afterward the regius professorship) in chemistry in Glasgow University was conferred on him in 1817. His great work on the atomic theory was published in 1825, under the title of "Attempt to Establish the First Principles of Chemistry by Experiment." In 1830–1831 he published his "History of Chemistry" in two volumes, and in 1836 appeared his "Outlines of Mineralogy and Geology." He died in Kilmun, July 2, 1852.

Thomson, Thomas, a Scotch antiquary; brother of John Thomson; born in Dailly, Scotland, in 1768. He was called to the Scotch bar in 1793, appointed deputy-clerk register 1806, and principal clerk of session in 1828. He was one of the founders of the "Edinburgh Review," and president of the Bannatyne Club, for which and for the Maitland Club he edited numerous valuable works. He died near Edinburgh, Oct. 2, 1852.

Thomson, William, an English clergyman; born in Whitehaven, England, Feb. 11, 1819; was educated at Shrewsbury School and Queen's College, Oxford, of which he was successively fellow, tutor, and head. In 1858 he was chosen preacher of Lincoln's Inn, and in 1859 was appointed one of her majesty's chaplains in ordinary. Two years later (1861) he was raised to the Episcopal bench as Bishop of Gloucester and Bristol; but before he had held the appointment a year, he was transferred to the archbishropic of York. Dr. Thomson was author of a number of works, including: "An Outline of the Necessary Laws of Thought"; "The Atoning Work of Christ, viewed in Relation to some Current Theories"; "Crime and Its Excuses"; "Life in Light of God's Word" (sermons); "Limits of Philosophical Inquiry"; "Design in Nature"; and a series of essays entitled "Word, Work, and Will." He died in York, England, Dec. 25, 1890.

Thomson, Sir William, Lord Kelvin, a British scientist; born in Belfast, Ireland, June 26, 1824; was educated at Glasgow University and Cambridge University; and was Professor of Natural Philosophy in the University of Glasgow after 1846. As such he did enduring work of his own, and guided the careers of several other great scientists. He was electrician for the Atlantic cables of 1857–1858 and 1865–1866, being knighted on the successful completion of the latter; was electrical engineer for the French cable (1869), the Brazilian and River Plata cable (1873), the West Indian cables (1875), and the Mackay-Bennett Atlantic cable (1879). He invented the mirror galvanometer and siphon recorder for submarine telegraphy, and various kinds of apparatus for navigation and deep-sea exploration. His scientific papers have been published under the titles "Reprints of Papers on Electrostatics and Magnetism" (1872); "Mathematical and Physical Papers" (1882–1890); "Popular Lectures and Addresses"; "On Heat"; "On Elasticity." In 1867, in collaboration with Professor

Tait of Edinburgh, he issued his first volume of "A Treatise on Natural Philosophy" (2d ed. in 2 parts, 1879). From 1846 to 1853 he was editor of the "Cambridge and Dublin Mathematical Journal"; and also connected with the "Philosophical Magazine." He was president of the British Association for the Advancement of Science, and of the Royal Society of London. He was made an officer of the Legion of Honor (1889) and a peer (1892) and received various degrees, decorations, etc., both at home and from foreign countries. In June, 1895, the Glasgow University celebrated the 50th anniversary of his election to the chair of natural philosophy, one feature being a cable dispatch sent by Lord Kelvin around the world and back in four minutes. He died Dec. 17, 1907.

Thomson, William McClure, an American clergyman; born in Springfield (now Spring Dale), O., Dec. 31, 1806. In 1833 he went as missionary to Syria and Palestine, remaining till 1876. His chief work, "The Land and the Book" (2 vols. 1859–1860; 3 vols. 1880–1886), is an accepted authority on Palestine and Syria. He has also published: "The Land of Promise"; "Travels in Palestine" (1865). He died in Denver, Col., April 8, 1894.

Thomsonite (after R. D. Thomson) a member of the group of Zeolites. Crystallization, orthorhombic, occurring as individual crystals, but more often in radiated groups, also compact; hardness, 5-5.5; sp. gr. 2.3–2.4; luster, vitreous to pearly; color when pure, snow-white; brittle; pyroelectric. Composition: Silica, 38.9; alumina, 31.6; lime, 12.9; soda, 4.8; water, 13.8 = 100. Formula, $2SiO_2Al_2O_3(\frac{3}{4}CaO + \frac{1}{4}NaO)2\frac{1}{2}HO$. Prof. James D. Dana divides as follows: 1. Ordinary: (1) in regular crystals; (2) in slender prisms, sometimes radiated; (3) radiated fibrous; (4) spherical aggregations of radiated fibers or crystals; (5) massive: 2. Mesole: including scoulerite: 3. Chalilite. Occurs in cavities in old amygdaloidal lavas, and metamorphic rocks.

Thonissen, Jean Joseph (tōn'is-sen), a Belgian jurist; born in Hasselt, Belgium, Jan. 21, 1817. He was Professor of Jurisprudence at the University of Louvain. Among his writings are: "Socialism and Its Promises" (1850); "Socialism in the Past" (1851); "Belgium in the Reign of Leopold I." (4 vols. 1855); "The Pretended Necessity of the Death Penalty" (1864); "The Penal Laws of the Athenian Republic" (1876). He died in Louvain, Belgium, Aug. 17, 1891.

Thor, the son of Odin and Jörd; in Northern mythology, the highest of the Æsir after Odin. He is the strongest of all the gods, and defends Asgard and Midgard against the Jotuns. His kingdom is called Thrudvangar; his palace, Bilskirnir, has 540 rooms, and is the largest in the world. He rides in a car drawn by two he-goats amid thunder and lightning. His mailed hands grasp the hammer Mjölnir, well known of the Jotuns, for many of their skulls has it crushed. When he girds on his Belt of Strength his power is doubled. His wife is called Sif, and his sons are named Modi and Magni.

Thoracic Duct, the name applied to the tubular structure in which the absorbent system of vessels may be said to terminate, and into which the lacteals of the intestine ultimately pour their contained fluid. It thus receives (1) the products of digestion or chyle from the lacteal vessels of the intestine, and (2) the lymph or fluid, brought as the elaborated waste-matters of the body from the tissues by the absorbent system of vessels or lymphatics. Being poured into the thoracic duct, these products, which are destined to replenish the blood, and thus renovate the tissues, are in due course poured into the circulation. The thoracic duct of man exists as a tubular structure attaining a length of about 18 or 20 inches. It extends from the second lumbar vertebra to the root of the neck, where it ends in the angle formed by the junction of the left internal jugular and subclavian veins, into which vessels its contents are therefore poured. At its commencement in the abdomen it exhibits a dilatation, termed the receptaculum chyli, which receives the lymphatics of the lower extremities. The thoracic duct has a flexuous course, and exhibits an irregular or contracted appearance. It is provided internally with valves, preventing the backflow of its contained fluid. Occasionally it divides above into two branches; and a right thoracic duct is normally found as a short trunk attaining about an inch in length, and devoted to the reception of the neck, from the right side of the chest and lymph from the right side of the head and heart, and from other regions on that side of the body. In birds, the right thoracic duct may be equally developed with the left.

Thoracic Fins, in ichthyology, a term applied to the ventral fins, when they are situated behind the pectorals.

Thoracic Myalgia, in pathology, a hot wearying pain in the tendinous insertions of the fleshy bodies of the pectoral and sometimes of the intercostal muscles, arising from overwork. Rest, a flannel bandage round the thorax, friction with anodyne liniments, and attention to the general health are the appropriate remedies.

Thoracic Regions, in anatomy, 14 regions into which the thorax in man is divided by imaginary straight lines, lon-

gitudinal and transverse, so that the exact situation of any spot may be described.

Thoracica, in zoölogy, an order of *Cirripedia*. Carapace either a capitulum or a pedicle, or an operculated shell with a basis. Body formed of six thoracic segments, generally furnished with six pairs of limbs; abdomen rudimentary, but often bearing caudal appendages.

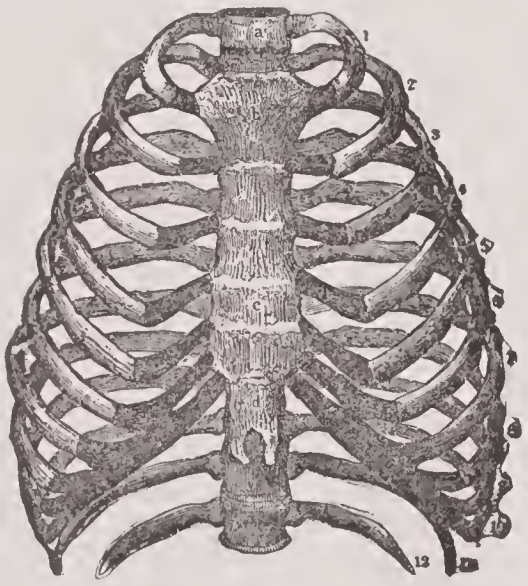
Thoracici, a Linnæan group of fishes, having the ventral fins inserted on the abdominal surface below the pectorals.

Thoracipoda, in zoölogy, a division of Crustacea, having the special locomotory organs belonging to the thorax. It contains two legions, Podophthalmia and Edriophthalmia.

Thoacoceras, in palæontology, a genus of *Orthoceratidæ*. Shell straight, elongated, conical, with a small, lateral, straight siphuncle. Known species 20; from the Silurian to the Carboniferous of the United States and Europe.

Thoracosaurus, in palæontology, a genus of Huxley's *Eusuchia*, peculiar to the Chalk of North America. They belong to the *Procœlia* of Owen.

Thorax, the breast, and specially the bones inclosing it. It is somewhat conical, with convex walls. Its upper opening is



THORAX.

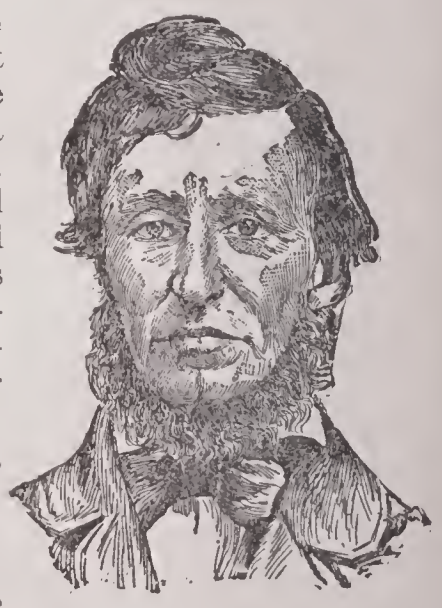
1-12, ribs; a-d, bed.

contracted, and bounded by the first dorsal vertebra, the first pair of ribs, and the manubrium of the sternum. Its inferior margin slopes downward on each side to the 12th rib; its longitudinal axis is directed upward and somewhat backward; its transverse diameter at the widest part greatly exceeds the distance from the breast to the back. It consists of the dorsal vertebræ, the sternum, the ribs, and the costal cartilages, and contains the lungs, the heart, etc. The muscles of the thorax are: The intercostals. levatores costarum, the subcostals, triangularis sterni, with which may be included the diaphragm. In comparative anatomy, the part of the trunk above or anterior to the diaphragm. In entomology, the central division of the body of insects. It is formed of three consolidated somites or segments; the prothorax, the mesothorax, and the metathorax. Also, a breastplate, cuirass, or corselet; more especially the cuirass or corselet worn by the ancient Greeks, corresponding to the lorica of the Romans. It consisted of a breast and a backpiece fastened by buckles, and was often richly ornamented.

Thorbecke, Heinrich (tōr-bek'e), a German Orientalist; born in Meiningen, Germany, March 14, 1837. He was appointed professor in the University of Halle, 1887. His studies were directed mainly to the poetry of the Bedawîn and the history of Arabic. He was author of: "Life of Antarah, the Pre-Islamite Poet" (1868); "Al Ashâ's Song of Praise to Mohammed" (1875); "M. Sabbâg's Grammar of Conversational Arabic in Syria and Egypt" (1886). He died in Mannheim, Germany, Jan. 3, 1890.

Thorburn, Grant, pseudonym Lawrie Todd, an American author; born in Dalkeith, Scotland, Feb. 18, 1773; emigrated to America in 1794. As the hero of Galt's novel, "Lawrie Todd," he was a well-known figure in New York, where he followed the business of seedsman. He was noted for his charity. His publications in book form include: "Forty Years' Residence in America" (1834); "Men and Manners in Great Britain" (1834); "Fifty Years' Reminiscences of New York" (1845); "Hints to Merchants," etc. (1847); "Notes on Virginia" (1848); "Life and Writings of Grant Thorburn" (1852–1853). He died in New Haven, Conn, Jan. 21, 1863.

Thoreau, Henry David (thō'rō), an American author; born in Concord, Mass., July 12, 1817, and educated at Harvard University, where he graduated in 1837. From that time till 1840 he was engaged as a schoolmaster. Then for several years he occupied himself in various ways, in land surveying, carpentering, and other handicrafts, but devoting a great part of his time to study and the contemplation of nature. In 1845 he built for himself a hut in a wood near Walden pond, Concord, Mass., and there for two years lived the life of a hermit. After quitting his solitude, Thoreau



HENRY D. THOREAU.

pursued his father's calling of pencil maker at Concord. Besides contributing to the "Dial" and other periodicals, he published "A Week on the Concord and Merrimac Rivers" (1849), and "Walden, or Life in the Woods" (1854). After his death appeared "Excursions in Field and Forest," "The Maine Woods," "Cape Cod," and "A Yankee in Canada." Thoreau was a friend of Emerson, and imbibed much of his spirit and method of thought. He died in Concord, May 6, 1862.

Thoresen, Anna Magdalena (Kragh) (tō'-re-sen), a Danish novelist; born in Fredericia, Denmark, June 3, 1819. Among the best of her works are: "Tales" (1863); "Signa Historiæ" (Signs of History: 1864); "Pictures from the West Coast of Norway" (1872); "Herluf Nordal: A Tale from the Last Century" (1879); "Short Tales" (1891). She was also the author of several dramas.

Thorictidæ, in entomology, a family of *Necrophaga*. Minute, broad, convex beetles, with the prothorax very large; antennæ clavate, eleven-jointed; tarsi five-jointed. Known species 20, all from the borders of the Mediterranean.

Thorild, Thomas (tōr'ild), a Swedish poet; born in Kongelf, Sweden, in 1759. His poetry was of less influence on the thought of his day than his prolemics. One of these, "A Critique of the Critics, with a Project of a Code for the Kingdom of Genius" (1791), had much to do with the development of Swedish poetry. He wrote also "Maximum, or Archimetria" (1799), an attempt at a system of philosophy. He died in Greifswald, Prussia, in 1808.

Thorina, ThO; thorinum oxide, or thorinic oxide; prepared from thorite by reducing it to a fine powder and decomposing with hydrochloric acid. After separation of various metallic oxides, it is treated with potassic sulphate and precipitated as potassio-thorinic sulphate. From the solution of the salt in hot water, ammonia throws down thorinic hydrate, which on ignition yields thorina. It is a white powder of a sp. gr. = 9.402. The ignited oxide is insoluble in hydrochloric and nitric acids, and only difficultly soluble in sulphuric acid.

Thorinum, in chemistry, a divalent metallic element belonging to the group of earth metals discovered by Berzelius, in 1828, in thorite. At. wt.= 115.7; symbol, Th. It is a very rare element, and is obtained by heating the anhydrous chloride with potassium. The reduced thorinum is a gray metallic powder, having a sp. gr. of 7.65–7.79. When heated, it burns with a bright flame, producing snow-white thorina without any trace of fusion. It is not oxidized by either hot or cold water, dissolves slowly in nitric and sulphuric acids, more easily in hydrochloric acid, and is not attacked by caustic alkalies. Thorinum is used in the making of incandescent mantles.

Thorinum Chloride, $ThCl_2$; prepared by heating an intimate mixture of thorina and charcoal in a stream of dry chlorine gas. It is deposited on the cool part of the tube in white, shining crystals, which are rectangular, four-sided tables. They deliquesce in the air, and dissolve in water with rise of temperature.

Thorinum Hydrate, $Th(HO)_2$; obtained as a gelatinous mass by the action of caustic alkalies on solutions of thorinum salts. Under the air pump it dries up into a white powder, readily soluble in all acids, excepting oxalic, molybdic, and hydrofluoric acids.

Thorinum Sulphide, ThS. Thorinum burns in the vapor of sulphur, forming a yellow pulverulent sulphide, which acquires metallic luster by pressure. It is very slowly attacked by acids, and is converted into thorina by roasting.

Thorite, an isometric mineral with a tetrahedral habit; occurring in crystals and massive in syenite, near Brevig, Norway. Also found as pseudomorphs in the form of zircon and orthoclase; hardness, 4.5–5; sp. gr. 4.3–5.4; luster, vitreous to resinous; color, orange to brownish-yellow, black; streak, light-orange to dark-brown. Composition: Essentially a silicate of thoria; silica, 17.0; thoria, 76.2; water, 6.8 = 100 which is equivalent to the formula $ThO_2SiO_2+1\frac{1}{3}HO$.

Thorn, a sharp conical projection constituting the growing point of a branch which has proved abortive. That this is its origin is shown by the fact that sometimes trees, which are thorny in their wild state, have their spines converted into branches when long cultivated in a garden, as is the case with the apple and the pear. A thorn differs from a prickle, which is so superficial that it comes away when the bark is peeled off, while in similar circumstances a thorn, being deep seated, remains. Sometimes thorns bear leaves, as in the whitethorn.

Thorn, a strongly fortified town in the province of West Prussia, on the right bank of the Vistula (here spanned by a viaduct 1,100 yards long), 31 miles E. S. E. of Bromberg. Founded by the Teutonic order in 1231, and a member of the Hanseatic League, Thorn contains a town hall and a number of other buildings remarkable for their beautiful gables and interiors; became a Polish town in 1454; and was annexed to Prussia in 1793, and again finally in 1815. It became an important fortified stronghold in the 17th century; was five times besieged between 1629 and 1813; and

since 1878 has been made a fortress of the first rank by Prussia, the old fortifications being removed, and a series of detached forts built. Copernicus was a native; and a colossal bronze statue of him was erected in 1853. An active trade in corn and timber is carried on. Pop. (1895) 30,306.

Thorn, Conference of, an effort to explain away the differences between Catholics and Protestants, with a view to reunion. The gathering was originated by Ladislaus IV. of Poland. It met in August, 1645, lapsed into disputation, and broke up in November.

Thorn Apple, *Datura*, a genus of plants of the natural order *Solanaceæ*, having a tubular five-cleft calyx, a large funnel-shaped five-lobed corolla, a two-laminated stigma, and an imperfectly four-celled,

COMMON THORN APPLE, DATURA STRAMONIUM.

a, ripe fruit.

prickly, or unarmed capsule. The species of this genus are annual herbaceous plants, rarely shrubs or trees; they are in general narcotic, and productive of wild excitement or delirium. The common thorn apple, or stramonium (*D. stramonium*), is an annual plant, with smooth stem and leaves, white flowers, and erect prickly capsules, a native of the East Indies, but now often met with in Europe, as also in Asia, the N. of Africa, and North America. It contains a peculiar alkaloid, daturine, which is, practically identical in its action with atropine. The leaves and seeds are employed in medicine. The dried leaves have a faintly narcotic smell, and an unpleasant bitter taste, the seeds, which are of a black color, are still more poisonous. A variety with pale violet flowers and purplish violet stem is frequently cultivated in gardens as an ornamental plant. Still more narcotic is the soft-haired thorn apple (*D. metel*), a native of the S. of Asia and of Africa. The Thugs of India employed it in order to stupefy their victims, or, in other cases, to poison them outright. From its seeds, along with opium, hemp, and certain spices, a strong intoxicating substance is prepared, which the Mohammedans of India use in order to produce in themselves an indescribable joyfulness and extremely pleasurable feeling for a short time; but the use of it destroys the constitution. *D. tatula*, another Indian species, has similar properties, and is very energetic. *D. sanguinea*, the red thorn apple of Peru, is used by the Indians to prepare a very powerful narcotic drink called tonga, which stupefies when very diluted, and when strong brings on maniacal excitement. The beautiful *D. fastuosa* has flowers externally of a violet color, and white within, and is cultivated as an ornamental plant, especially a variety with what are called double flowers, which consist rather of two corollas, one within the other. *D. arborea*, a native of Peru and Colombia, has begun to be also very generally cultivated in flower gardens in Europe. It has pendulous white flowers, 9 to 12 inches long, which diffuse a sweet smell at night.

Thornback, the name of a species of ray (*Raia clavata*), distinguished by the short and strong recurved spines, rising from a broad osseous tubercular base, which are scattered over the back and tail. Two of these broad-based spines occupy the central ridge of the nose.

Thornbury, George Walter, an English author; born in London in 1828. Beginning his literary career in Bristol at the age of 17, he soon after settled in London, where for 30 years he was almost continuously at work writing for "Household Words," "Once a Week," and "Athenæum," etc. Among his numerous works are "Shakespeare's England," "Songs of the Cavaliers and Roundheads," "Haunted London," "Legendary and Historic Ballads," and a "Life of Turner," under the supervision of Ruskin. He died in London, June 11, 1876.

Thorndike, Edward Lee, an American educator; born in Williamsburg, Mass., Aug. 31, 1874; was graduated at Wesleyan University in 1895; pursued post-graduate studies at Harvard and Columbia Universities in 1895–1898; was instructor of genetic psychology at the Teachers' College of Columbia University in 1899–1901, and in 1904 he was made full professor. He was the author of "The Human Nature Club" (1900); and review contributions on "Animal Intelligence: An Experimental Study"; etc.

Thorne, Joseph, an American inventor; born in Marlboro, N. Y., Feb. 17, 1826; was of Quaker parentage; served through the Mexican War; became an engineer and was

associated with Elias Howe while he was perfecting his sewing machine. Afterward he was connected with the Singer Company; established and operated a factory in Scotland; invented a typewriter, a sewing machine, a typesetting and distributing machine, etc. He died in Sing Sing, N. Y., May 4, 1897.

Thornheaded Worms, or **Acanthocephala,** a group of *Scolecida,* allied to the Nematoid worms, and so named from the armature of the head. They are internal parasites, possessing neither mouth nor digestive system, and having a proboscis armed with hooks. The sexes are distinct. The only distinct genus is *Echinorhynchus,* the species of which, in a fully-grown condition, inhabit the digestive system of vertebrates, and occur in fishes, birds, and mammals. The young undergo a metamorphosis. Thus the embryos of *E. gigas,* which inhabit the pig's intestine, are found in the larvæ of the cockchafer.

Thornhill, Sir James, an English painter; born in Melcombe, Regis, England, in 1676. He was much engaged in the decoration of palaces and public buildings. Among his best efforts may be mentioned the dome of St. Paul's, the saloon and refectory at Greenwich Hospital, and some rooms at Hampton Court. His forte was in the treatment of allegorical subjects. He was court painter to George I., by whom he was knighted in 1715. He was the teacher of Hogarth, who became his son-in-law. He died near Weymouth, England, May 13, 1734.

Thorntail, in ornithology, a popular name for the species of two genera of humming birds — *Gouldia* (four species) and *Discura* (one). The tail feathers in the first genus are much elongated and sharply pointed, and the tarsi are covered with a tuft of feathers. Discura has a racket at the end of the tail.

Thornton, Mathew, an American statesman; born in Ireland about 1714; came to America in 1717; engaged in the expedition against Louisburg as surgeon in the New Hampshire troops; took an active part in the overthrow of the royal government in New Hampshire; was president of the provincial convention of 1775 and speaker of the assembly in 1776; and served as judge of the Superior Court in 1776–1782. He was a delegate to the Continental Congress in 1776; and a signer of the Declaration of Independence; a member of the General Court of Massachusetts; and in 1785 was appointed a member of the General Council. He died in Newburyport, Mass., June 24, 1803.

Thornycroft, William Hamo, an English sculptor; born in London, March 9, 1850; studied at the Royal Academy schools. "Artemis" (1880) was his first success; others were: "Teucer" (1881); "The Mower" (1884); and the portrait statues of General Gordon in Trafalgar Square (1885); and of John Bright at Rochdale (1892); Queen Victoria in the Royal Exchange; and a bust of Coleridge for Westminster Abbey (1885). He was made a member of the Royal Academy in 1888.

Thornycroft, John Isaac, an English engineer; born in Rome, Italy, Feb. 1, 1843; studied practical engineering; designed the "Ariel," a fast steamboat; drew the plans for the "Miranda" the forerunner of the modern torpedo boat; went through the engineering course at Glasgow University; studied shipbuilding at Govan on the Clyde, and finally settled in Chiswick, England, as a designer and builder of torpedo boats and there constructed several such vessels for the British navy. Knighted in 1902.

Thorough Wax, Thorow-wax, or **Throw-wax,** in botany, the *Bupleurum rotundifolium.* The stem is branched; the leaves ovate, perfoliate; the flowers greenish-yellow, with large bracts; fruit with striate interstices. The name was given by Turner because, as he says, "the stalke waxeth thro the leaves." It was formerly used as a vulnerary. It is a native of Europe and Western Asia; rare in Great Britain.

Thoroughwort, in botany, the *Eupatorium perfoliatum.* The stem is round, erect, and hairy; the leaves subsessile, opposite, linear-lanceolate, acuminate, serrate, wrinkled, pale underneath and hairy; the involucre cylindrical and imbricated; the 12 to 15 florets tubular. It grows in bogs in North America. The whole plant is intensely bitter. A decoction of the leaves has been given as a febrifuge. In larger quantities it is emetic, sudorific, and aperient. Called also boneset and crosswort.

Thorp, the Scandinavian equivalent of the German *dorf,* "a village," in local nomenclature sometimes stands by itself, *e. g.,* Le Torp, in Normandy; but oftener appears as a suffix, as in English Althorpe, Wilstrop, and Norwegian Clitourps. Being Danish rather than Norwegian, this suffix often helps us to determine whence Scandinavian settlers arrived in England; and while it is very common in East Anglia, it occurs very seldom in Westmoreland, but once in Cumberland, and never in Lancashire.

Thorpe, Benjamin, an English scholar; born about 1808. Among his numerous publications are an English edition of "Rask's Anglo-Saxon Grammar," "Ancient Laws and Institutes of the Anglo-Saxon Kings," "The Gospels in Anglo-Saxon," an edition of "Beowulf," "The Anglo-Saxon Chronicle," "Northern Myth-

ology," etc. He died in London, July 19, 1870.

Thorpe, Francis Newton, an American author; born in Swampscott, Mass., April 16, 1857; was educated at Syracuse University and at the Law School of the University of Pennsylvania; was admitted to the bar; fellow professor of constitutional history at the latter institution in 1885–1898. He was the author of "The Government of the People of the United States" (1889); "Franklin and the University of Pennsylvania" (1893); "The Story of the Constitution" (1891); "The Government of the State of Pennsylvania" (1894); "The Constitution of the United States with Bibliography" (1894); "A Constitutional History of the American People, 1776–1850" (1898); and "A History of the United States for Junior Classes" (1901).

Thorpe, Kamba. See BELLAMY, ELIZABETH WHITFIELD.

Thorpe, Rose Hartwick, an American author; born in Mishawaka, Ind., July 18, 1850; received a high school education. She became widely known because of her poem "Curfew Must Not Ring Tonight." Her other publications include "Fred's Dark Days" (1881); "Nina Bruce" (1886); "The Chester Girls" (1887); "The Year's Best Days" (1889); "Temperance Poems" (1887); "Sweet Song Stories" (1898); "Ringing Ballads" (1887); etc.

Thorwaldsen, Albert Bartholomew (Bertel) (tor'vald-sĕn), a Danish sculptor; born in Copenhagen, Denmark, Nov. 19, 1770. At first he helped his father to cut figure heads in the royal dockyard, then, after some years' study at the Academy of Arts, he won the privilege of studying three years abroad. Going to Rome (1797) he studied the works of Canova the sculptor, and Carstens the painter. In 1803, he received a commission from Sir Thomas Hope to execute in marble a statue of Jason, already modelled. Commissions flowed in on him, new creations from his hand followed in quick succession, and his unsurpassed abilities as a sculptor became everywhere recognized. In 1819 he returned to Denmark, and his journey through Germany and his reception at Copenhagen resembled a triumph. After a year in Copenhagen he returned to Rome, visiting on his way Berlin, Dresden, Warsaw, and Vienna. He remained at Rome till 1838, when he undertook another journey to Copenhagen, being principally moved to this step by the contemplated establishment in that city of a museum of his works and art treasures. His return was a sort of national festival. The remainder of his life was spent chiefly in the Danish capital. Thorwaldsen was eminently successful in his subjects chosen from Greek mythology, such as his Mars, Mercury, Venus, etc. His religious works, among which are a colossal group of Christ and the Twelve Apostles, St. John Preaching in the Wilderness, and statues of the four great prophets, display almost superior grandeur of conception. Chief among his other works are his statues of Galileo

THORWALDSEN.

and Copernicus, and the colossal lion near Lucerne, in memory of the Swiss guards who fell in defense of the Tuileries. He died in Copenhagen, March 24, 1844. The Thorwaldsen Museum, opened in 1846, contains about 300 of the works of the sculptor.

Thoth, or **Taut,** an Egyptian deity identified by the Greeks with Hermes (Mercury), to whom was attributed the invention of letters, arts, and sciences. The name is equivalent in significance to the Greek Logos, and Thoth is a mythical personification of the divine intelligence.

Thothmes III. (Tehuti-mes), an Egyptian king of the 18th dynasty; lived about 1600 B. C. and reigned for 54 years. He was famous for his conquests and carved upon the temple walls of Karnak the names of 625 vanquished cities and nations.

Thou, Jacques Auguste de (tö), a French statesman and historian; born in Paris, Oct. 8, 1553. Henry IV. employed him in several important negotiations, and in 1593 made him his principal librarian. In 1595 he succeeded his uncle as chief-justice, and during the regency of Mary de Medici he was one of the directors-general

of finance. His greatest literary labor was the composition in Latin of a voluminous "History of his own Times" (Historia sui Temporis), comprising the events from 1545 to 1607, of which the first part was made public in 1604. To this work, which is remarkable for its impartiality, he subjoined interesting "Memoirs" of his own life. He died May 7, 1617.

THOTH.

THOTHMES III.

Thought Transference. See TELEPATHY.

Thous, in zoölogy, according to Hamilton Smith, a section of *Canidæ*, having the form of wolves on a small scale; not more than 18 inches high; structure very light; tail rather short, forming a scanty brush, tip black; fur close, hard; livery mostly chequered, or penciled with black and white, extremities buff; they are not gregarious and do not burrow. From Africa and Southwestern Asia. Some of the species are now classed with *Canis* and others with *Vulpes*.

Thousand and One Nights, The. See ARABIAN NIGHTS' ENTERTAINMENT.

Thousand Islands, a group of small islands numbering about 1,800 in the St. Lawrence immediately below Lake Ontario. They belong partly to Canada and partly to the State of New York, and have become a popular summer resort.

Thrace, the ancient name of the Turkish province of Rumelia. It is said to have been peopled by a tribe of Pelasgians. The authentic history of the country commences with the formation of the Greek settlements in the 6th century, B. C. Of these, the principal were Byzantium (675 B. C.), Selymbria, Abdera (560 B. C.), Mesembria, Dicæa, Maronea, Ænus, Cardia, Sestus, Amphipolis, etc.; but their want of union enabled the Thracian chiefs of the interior to preserve their independence. In 513 B. C., Darius, King of Persia, marched through Thrace on his way to punish the European Scythians, and on his return, left Megabazus, with 80,000 men, to subdue the country. In this he partially succeeded, but new disturbances and complications arose between the Persians and Greeks, which resulted (480 B. C.) in the famous expedition of Xerxes. The rise of the Macedonian kingdom, under Philip II. (359 B. C.), destroyed the independence of a great part of Thrace. Under the government of Lysimachus, Thracia was incorporated with Macedonia, and became complete. On the fall of the Macedonian kingdom (168 B. C.), it passed into the hands of the Romans, and subsequently shared the vicissitudes of the Roman empire. In 305, it was overrun by Alaric, and in 447, by Attila. In 1353, Amurath obtained possession of all its fortresses, except Constantinople, and it has ever since remained in the hands of the Turks.

Thracia, in zoölogy, a genus of *Anatinidæ*. Shell oblong, nearly equivalve, slightly compressed, attenuated, and gaping behind; cartilage processes thick; pallial sinus shallow. Animal with the mantle closed; foot linguiform; siphon rather long, with fringed orifices. They live in water from 4 to 120 fathoms deep. Recent species 17, from the United States, Greenland, Great Britain, Norway, the Mediterranean, the Canaries, China, etc.; fossil 36, from the Lower Oölite, if not the Trias, onward.

Thracian Chersonesus. See GALLIPOLI.

Thrasaetus, in ornithology, a genus of *Buteoninæ*, with one species, *T. harpya*, the harpy eagle, ranging from Mexico to Brazil and Bolivia. Bill like aquila, nostrils narrow, and set somewhat crosswise; wings with fourth, fifth, and sixth quills longest; tail long and rounded; tarsi short, stout, with large scales in front and small ones at side; toes powerful. *T. harpyia* is a great crested eagle, and is one of the largest and strongest birds of prey in its tribe.

Thrasybulus, an Athenian general, who in the time of the Thirty Tyrants, took refuge at Thebes. Having gained some followers, he marched against the usurpers and expelled them. In commemoration of this triumph, a yearly festival was instituted at Athens. Thrasybulus wisely procured the passing of a general amnesty, which decreed that no one but the principals should be punished for the atrocities which had been committed. He subsequently displayed great valor in Thrace, and slew the Lacedæmonian general with his own hand. Trasybulus fell in a battle with the Aspendians, who were the allies of Sparta, 394 B. C.

Thraulite, See GILLINGITE.

Thread, a compound cord consisting of two or more single yarns, doubled and twisted. In the trade it is divided into lace, stocking, and sewing thread. Any fibrous substance, such as cotton or flax, when it is to be woven, is first spun into yarn, which is sometimes called thread. Sewing thread, however, always consists of at least two or more yarns twisted together. In the spinning of yarn the process is the same whether it is to be woven into cloth or twisted into thread. Beginning with the spun yarn, the stages in the process of manufacturing a six-cord cotton thread (a very common kind) are: (1) The yarn is doubled and wound on bobbins; (2) the double yarn is then twisted into a two-ply thread; (3) the thread is next rewound on bobbins for the second twist; (4) the thread is twisted a second time on the twisting frame, three two-ply threads being thus formed into a six-cord thread; (5) the thread is rewound on large bobbins, from which it is reeled into hanks for bleaching or dyeing; (6) the bleached or dyed thread is next rewound on bobbins for spooling; (7) spooling—*i. e.*, winding the thread on small bobbins called spools or pirns for use. The spindles of the spooling machine run at a speed of 7,000 revolutions per minute.

Cotton thread is made at Manchester and in its neighborhood, as well as at Glasgow. Paisley is, however, the principal seat of the manufacture in Great Britain. The making of thread on an industrial scale was begun in that town in 1722 by Christian Shaw of Bargarran. She had obtained information from Holland about the process of making linen thread, and what she and her friends manufactured was sold at the time under the name of "Balgarran thread." The industry did not become of great importance so long as flax was the material used. But in the early part of the 19th century, when the spinning machines of Hargreaves, Arkwright, and others came largely into use, the manufacture of cotton thread was begun in Paisley, and its progress has been on the whole rapid. This has been especially the case since 1860 through the constantly increasing use of sewing machines for both domestic and factory purposes. The mills of Messrs. J. & P. Coats, Limited, are spread over 40 acres of ground, and give employment to fully 5,000 persons; and this firm has also established works at Pawtucket, R. I., and at St. Petersburg. Next in importance are the works of the Messrs. Clark. In the United States thread is made in several States. The Clarks have large thread mills in Newark and Harrison, N. J.

Linen thread is made at Johnstone near Paisley, Belfast, Nottingham, and other places. Although a much less quantity of it is manufactured, it is perhaps used for a greater variety of purposes than cotton thread. Fine kinds are required for lace-making, and strong kinds for sewing heavy fabries, as well as for shoemakers', saddlers', and bookbinders' use. Silk thread, the stronger kinds of which are called twist, is now used to a very large extent for sewing dyed articles of dress.

Cotton was first used in the manufacture of sewing thread at Pawtucket, R. I., by Samuel Salter in 1794. Flax had always been used everywhere, but as Mrs. Salter was spinning cotton, she noticed the fineness of the fiber, and at once conceived that it would make smooth thread. The idea was at once put into practice.

Thread Cells, the name given to certain peculiar eells or cysts, found chiefly in the tissues of *Cœlentcrate* animals. They contain fluid, and are provided with an internal thread-like filament. Under pressure the cell ruptures, the thread is everted, and the fluid escapes. These cells form a poison apparatus for paralyzing prey.

Thread Worms, the name for thread-like intestinal worms of the order *Nematoda.* The *Oxyuris vermicularis* occurs in great numbers in the rectum of children particularly.

Threatening, menacing, especially with ulterior designs. By the common law of England to threaten bodily hurt is a civil injury against the person, and pecuniary damages can be recovered for interruption of a man's business through fear of such threats. Any person accusing or threatening to accuse any other person of infamous or other crimes, with the view to extort gain, is guilty of felony. Similar provisions are made against sending or delivering any letter threatening any house, ship, etc., or to wound or maim eattle; sending or delivering any threatening letter demanding any property or valuable. Any person who malieiously sends or delivers, knowing the contents, any letter threatening to kill or murder any person, or to burn or destroy any eoal breaker, house, barn, or other building, or any rick or stack of grain or other agricultural produce, in most States is considered guilty of a misdemeanor, and on conviction is liable to fine and imprisonment. The English statutes on this subject have been adopted in the United States generally. See BOYCOTTING.

Three-Horned Chameleon, the *Chamœleon oweni* from Fernando Po. The male has a long horn over each eye, and another at the end of the muzzle, whence the popular name.

Three Hours' Agony, or **Three Hours' Service,** a devotion practised on Good Friday, from noon till three o'eloek, in eommemoration of the Passion. It was introduced by Father Messia, S. J., of Lima, about 1730, and reached Rome in 1738. It

was introduced into the English Church about 1865, and was rendered legal by the Act of Uniformity Amendment Act (1872), which permits additional services, consisting of any prayers from the Liturgy or Bible, with address or sermon, and hymns. The service consists, in all cases, of hymns, collects, or litanies, and addresses, generally on "the seven words from the cross," though this last feature is sometimes varied by meditations on other details of the Passion. The editor of the "Dictionary of Religion" notes that the name of the devotion may possibly occasion a mistake as to the length of our Lord's sufferings. (Mark xv: 25, 34.)

Three Kings, the name given in the Roman Church to the Magi, who came from the East to adore the Infant Jesus (Matt. ii: 1–12). They are probably called kings from Psalm lxxii: 10, which verse is used as an antiphon in the office for Epiphany. According to tradition, their names were Gaspar, Melchoir, and Balthazar, and on their return to the East they received baptism. The Empress Helena is said to have brought their bones to Constantinople, whence they were removed to Milan, and afterward to Cologne. The Chapel of the Three Kings, built by the Emperor Maximilian (1459–1519), in Cologne Cathedral, is supposed to contain their relics. The mediæval legends concerning the "Three Kings" are numerous.

Three Rivers, a city and port of entry in St. Maurice co., Quebec, Canada; at the confluence of the St. Maurice and St. Lawrence rivers, and on the Canadian Pacific railroad; 95 miles N. E. of Montreal. Here are a bishop's residence, a cathedral, college, convents, and many handsome residences. The city has an extensive trade in lumber, and manufactures boots, shoes, stoves, car-wheels, and ironware. Three Rivers was founded by Laviolette under orders from Champlain in 1634. A battle which proved disastrous to the Americans was fought here on June 16, 1776. Pop. (1891) 8,334; (1901) 9,981.

Thresher Shark, also called the Fox Shark, a genus of sharks containing but one known species, *Alopias vulpes,* with a short conical snout, and less formidable jaws than the white shark. The upper lobe of the tail fin is very elongated, being nearly equal in length to the rest of the body, and is used as a weapon to strike with. Tail included, the thresher attains a length of 13 feet. It inhabits the Atlantic and the Mediterranean, and is sometimes met with on the coasts of Great Britain. See Shark.

Threshold, the sill of a doorway; a gate or entrance.

Thrift, in botany, the genus *Armeria,* called also seapink, specifically, *Armeria vulgaris* or *maritima* (*Statice Armeria,* Linn.): leaves densely fascicled, linear, usually one-nerved, pubescent or ciliate, with impressed points both above and below; inflorescence a scape, bearing a head

COMMON THRIFT.

of rose-colored, pink, or white flowers, surrounded by a brown, membranous, three-leaved involucre, and intermixed with scales. It is found on seacoasts and on mountains, and is well adapted for edging in gardens.

Thrinax, in botany, the thatch palm, a genus of *Sabalidæ.* Calyx six-cleft, corolla none; stamens 6, 9, or 12, united at the base; ovary one-celled, with a single, erect ovule; fruit round. *T. argentea* is the silver thatch palm, the leaves of which are used in Jamaica for thatch. In Panama it is made into brooms.

Thrincia, in botany, a genus of *Scorzonereæ,* now reduced to a sub-genus of *Leontodon.* The pappus of the outer flowers consists of toothed scales, that of the inner is formed of feathery hairs. The buds are drooping. Common in all temperate regions, and popularly known as dandelion and lion's tooth. It has lanceolate, almost sinuo-dentate, leaves, somewhat hispid, and single flower scapes of yellow flowers. It grows in gravelly pastures, flowering in July and August.

Thring, Edward, an English educator; born in Alford Rectory, Somersetshire, Nov. 29, 1821; was educated at Eton and King's College, Cambridge, of which he was elected fellow. He took orders, and served in curacies at Gloucester and elsewhere, but in September, 1853, found the work of his life in the appointment to be head master of Uppingham school. He found it insignificant, but made it one of the healthiest and

best equipped among the public schools of England. He finally limited the number of boys to 330, 30 to each boarding house, and he gave himself for 34 years with restless energy to the task of educating these in the highest sense of the word. No man ever estimated more highly the worth of life: no schoolmaster since Arnold was more successful in imprinting on the characters of his pupils a high ideal of duty as the great end of life. The manly fiber of his own nature, his earnestness and honesty, his firm discipline, and his stern denunciation of cowardice and wrong gave a distinctive character to the school. His publications include volumes of school songs and lyrics, an English grammar, a Latin gradual and a construing book: "Thoughts on Life Science," anonymously (1869), "The Theory and Practice of Teaching" (1883), "Uppingham Sermons" (2 vols. 1886), "Addresses" (1887), "Poems and Translations" (1887), and "Uppingham School Songs and Borth Lyrics" (1887). He died Oct. 22, 1887.

Thrips, a genus of minute insects, order *Hemiptera*, sub-order *Homoptera*, closely allied to the *Aphides*. They are extremely agile and seem to leap rather than fly. They live on flowers, plants, and under the bark of trees. *T. cercalium* is a common species, scarcely a line in length or in extent of wing, residing in the spathes and husks of cereals, especially wheat, to which it is most injurious.

Thrissa, or **Thryssa,** in ichthyology, a genus of *Clupeidæ*, differing from the anchovies with a dentated belly only in the great prolongation of the maxillaries. Found in the East Indies.

Throat, the anterior part of the neck of an animal, in which are the œsophagus and windpipe, or the passages for the food and breath. See TRACHEA.

Throat, Diseases of the. The diseases of the throat met with in the practice of medicine do not differ materially from the diseases of other parts of the body. The most frequent form of sore throat is that of a simple erythematous inflammation. The mucous membrane of the pharynx, palate, and tonsils is congested and swollen, and the sub-mucous connective tissue may be greatly relaxed. There is usually more or less heat and dryness of the parts, difficulty in swallowing owing to the pain excited by the movement, and almost always some degree of fever, with more or less acceleration of the pulse. The treatment of this form of sore throat is very simple. The patient should be confined to bed in order to secure rest and an equable temperature, which is of great importance. A gentle but efficient laxative should be given, and if the pain is severe and the pulse accelerated, a small quantity of morphia and aconite may be added to the aperient. The diet should be light and easily digestible, and the free use of demulcent drinks may be encouraged. The inhalation of steam will be of service in the acute stage, and if the membrane be very much relaxed, astringent solutions of alum, nitrate of silver, carbolic acid, or chlorate of potass, may be topically applied in the form of a spray. In phlegmonous sore throat there is a higher grade of inflammatory action, the sub-mucous connective tissue being affected, and the tonsils are usually affected in a greater degree than the surrounding structures, the disease being designated amygdalitis, quinsy, or tonsilitis. Ulcerated sore throat is often described under the name of angina maligna, or tonsillitis maligna, and is usually attended with typhoid symptoms. It is occasionally attendant on diphtheria, and sometimes follows scarlatina, measles, smallpox, dysentery, and enteric fever; more or less fever of a low type being always present. The pain is not so severe as in ordinary sore throat, but soon after the commencement of the affection the tonsils and the surrounding structures are seen to be studded with dark ash-colored ulcers, which soon slough, and give forth a fetid, ichorous, or sanious discharge. The disease is apt to extend to the upper part of the pharynx and to the nasal passages, but the larynx is seldom involved. In severe cases death may occur from syncope, coma, or from gradual exhaustion of the vital forces. Membraneous sore throat is characterized by the exudation of a fibrinous material, which coagulates into a false membrane. This form of sore throat is often met with during the prevalence of diphtheria and is by many physicans considered a mild form of that disease.

Throatwort, in botany: (1) *Campanula trachelium*, the nettle-leaved bellflower; a tall, hispid plant, with an angled stem, ovate-lanceolate leaves, and bluish-purple flowers; found in England, the European continent, etc. (2) *C. cervicaria*, which has light-blue flowers, and is a native of Germany. (3) *Digitalis purpurea*.

Thrombolite, an amorphous mineral of uncertain composition, occurring with malachite on a fine-grained limestone at Rezbanya, Hungary; hardness, 3.4; sp. gr., 3.38–3.67; luster, vitreous; color, shades of green; opaque. Composition stated to be a hydrated phosphate of copper, but the result of the latest analysis by Schrauf points to its analogy with stetefeldite, partzite, etc.

Thrombosis, in pathology, local formation of clot, called a thrombus, either in the heart or a blood-vessel during life. When it occurs in the systemic veins it is called *Phlegmasia dolens*.

Thrombus, in pathology, a tumor formed by blood effused from a vein and co-

agulated in the adacent tissue; the coagulum or clot, usually fibrinous in texture, which partially or totally closes a vessel in thrombosis.

Throndhjem. See TRONDHJEM.

Throne, the chair used on occasions of state by a king, emperor, or Pope. It is usually raised, and often surmounted with a canopy. The term is also applied to the seat of a bishop in his cathedral church, and is a common metaphor to express sovereign power.

Throne of Jamsheed, The, Persepolis, so named by its Persian founders. Jamsheed removed the seat of government from Balkh thither.

Throop, Polytechnic Institute, a co-educational non-sectarian institution in Pasadena, Cal.; opened in 1891; has productive funds exceeding $160,000; grounds and buildings valued at over $235,000; volumes in the library, about 4,000; scientific apparatus, etc., $37,000; average number of faculty, 40; average student attendance, 375; graduates, over 550; ordinary income, $95,000.

Throscidæ, in entomology, a family of *Serricornia*, one of those intermediate between *Buprestidæ* and *Elateridæ*. Small beetles of the form of *Buprestidæ* and with the same interlocking apparatus of the fore and middle sterna. The antennæ in repose are received into narrow furrows in the sides of the prosternum, and the feet are contractile. Known species about 100, chiefly from South America.

Throscus, in entomology, the typical genus of *Throscidæ*. Antennæ terminated by a three-jointed knob; mandibles simple; penultimate joint of each tarsus bifid.

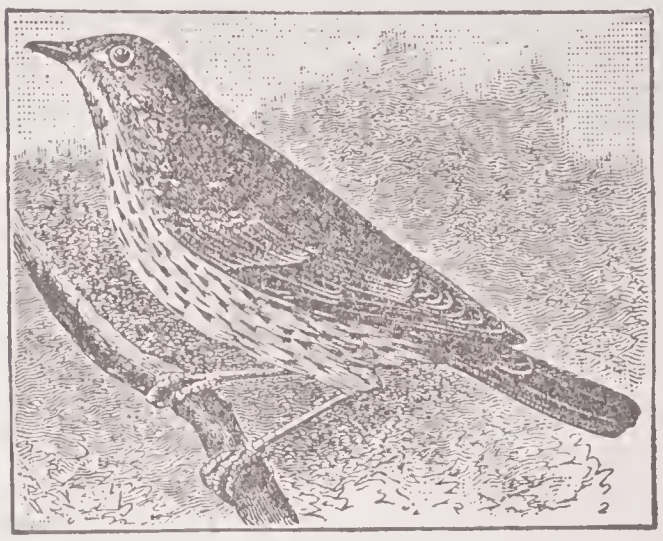
Throttle Valve, in machinery, a valve in the steampipe of an engine, for regulating the supply of steam to the cylinder. It is moved by a hand lever called the throttle lever.

Throw, a mining term used very generally among geologists; signifies the amount of vertical displacement produced by a fault.

Throw-stick, a short curved stick, usually with a carved serpent's head, with which the ancient Egyptians used to knock down game attracted by their call birds.

Thrums, weaver's ends and fag-ends of carpet, used for common rugs. Thread and thrum means everything, good and bad together.

Thrush, in ornithology, the name for any of the *Turdidæ*. They are universally distributed except in New Zealand, and are very highly organized birds, and it is for this reason, perhaps, as well as on account of their omnivorous diet, that they have been able to establish themselves on a number of remote islands. They differ widely in their habits and in their habitats; some are gregarious, others live solitarily or in pairs. The wood thrush (*Turdus mustelinus*) is abundant in



SONG THRUSH.

North America in summer, as far N. as Hudson Bay, retiring to tropical and subtropical regions in winter. It is rather smaller than the song thrush, and very similar to it. Several other species are found in North America. The type genus *Turdus* has several European species, but to only three of these is the name thrush applied. The song thrush, throstle, or mavis (*Turdus musicus*), the missel thrush (*T. viscivorus*), and white thrush (*T. varius*). The song thrush, generally spoken of without any qualifying adjective, is not quite nine

MISSEL THRUSH.

inches long; back and upper surface brown of slightly different shades, chin white, abdomen and tail coverts grayish-white; throat, breast, and flanks, together with the sides of the neck, yellow, thickly spotted with dark-brown. It is one of the best-known European song birds, and in captivity is easily taught simple airs. It is found all over Europe, but leaves some of the

N. parts in winter, being thus practically a bird of passage. It feeds on insects, worms, slugs, snails, and in the summer greedily devours cherries and smaller fruit. It usually builds in the center of a thick bush or shrub, but sometimes in an open shed, and lines the interior of the nest with mud, clay, or dung, so as to form a cup. The eggs are four to six in number, bright bluish-green, with brownish spots. The male takes part in the work of incubation, and is very attentive in feeding his mate while she is sitting. They usually produce two broods in the season.

Thrush, sometimes called INFANTILE SORE MOUTH, or DIPHTHERIA OF THE MOUTH, essentially a disease of early infancy. It is very frequently met with in connection with the artificial feeding of young children, and is evidently connected with impaired nutrition. It may also be the result of inflammation of the mucous membrane of the mouth, or it may depend on the development of cryptogamic vegetation on the mucous membrane. The symptoms are numerous small white spots on the mucous membrane of the mouth, the inner surface of the lips, and especially near the angles of the mouth, the inside of the cheeks, the tongue, and sometimes on the gums. The spots are generally of a circular form, about the size of a pin's head, and are firmly adherent. Sometimes the spots coalesce, and the mouth may be extensively coated with a false membrane, a condition sometimes called aphtha.

Thrush, in veterinary surgery, an affection of the horse's frog, appearing as a severe and acute inflammation, which usually proceeds to ulceration, and which is accompanied by a fetid discharge. It is most frequently seen in horses of unsound constitution, and especially appears in stables where the drainage is deficient, and uncleanliness prevails. The best application for it is mineral tar. Calomel dressing is to be substituted for the tar in severe and intractable cases, and ulcerated and loose parts of the frog are to be carefully removed.

Thrust, to push or drive with force; to impel with some degree of violence. In architecture, the horizontal force of an arch, by which it acts against the piers from which it springs. Also, a similar action of rafters or of a beam against the walls which bear them.

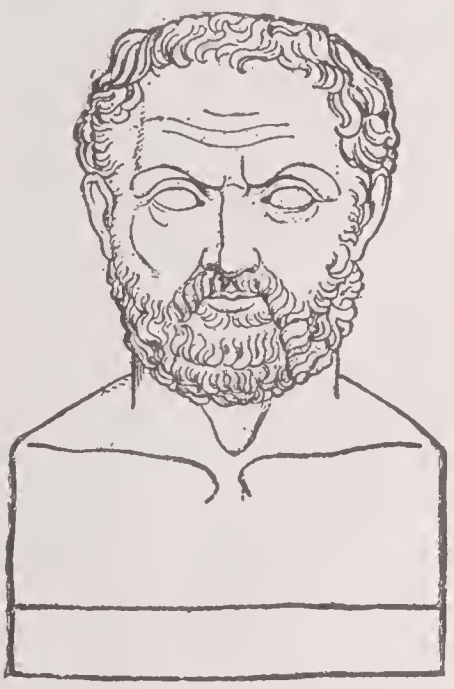
Thucydides, historian of the Peloponnesian war; born in the deme Halimus most probably in 471 B. C.; was the son of Olorus and Hegesipyle, and was related to Miltiades and Cimon. It is probable that his literary model was Antiphon, and that he was influenced in his views on philosophy by Anaxagoras. Certain it is that, Athenian as he was, of good family, and resident in the most cultivated community in Greece, he must have known Sophocles, Euripides, Aristophanes, Phidias, Protagoras, Gorgias, and possibly Herodotus and Æschylus. He was further possessed, either by inheritance or by acquisition through marriage, of gold mines in that part of Thrace lying opposite the island of Thasos. We know from himself that he was one of the sufferers from the terrible plague of Athens, and also one of the few who recovered. He held military command, and he had under him an Athenian squadron of seven ships at Thasos, 424 B. C., when he failed to relieve Amphipolis, which fell into the hands of Brasidas. Condemned to death as a traitor, he took refuge in exile and retired to his Thracian estates. His exile enabled him, as he tells us, to associate with the Peloponnesians quite as much as with the Athenians; and he probably spent some time also in Sicily, as we may infer from his minute descriptions of Syracuse and its neighborhood. According to his own account, he lived in exile 20 years, and probably returned to Athens after the destruction of its walls, in 404. How or when he died is unknown; but he did not live long enough to revise book viii. or to bring his history down to the end of the war.

If Herodotus was "the father of history," Thucydides was the first of critical historians, and no better account of his methods can be given than is contained in his own words: "Of the events of the war I have not ventured to speak from any chance information, nor according to any notion of my own; I have described nothing but what I either saw myself or learned from others, of whom I made the most careful and particular inquiry. The task was a laborious one, because eye witnesses of the same occurrences gave different accounts of them, as they remembered or were interested in the actions of one side or the other." There is hardly a literary production of which posterity has entertained a more uniformly favorable estimate than the history of Thucydides. This high distinction he owes to his undeviating fidelity and impartiality as a narrator; to the masterly concentration of his work, in which he is content to give in a few simple yet vivid expressions the facts which it must have often taken him weeks or even months to collect, sift, and decide upon; to the sagacity of his political and moral observations, in which he shows the keenest insight into the springs of human action and the mental nature of man; and to the unrivaled descriptive power exemplified in his account of the plague of Athens, and of the Athenian expedition to Sicily. Often, indeed, does the modern student of Greek history share the wish of Grote, that the great writer had been a

Thucydides

little more communicative on collateral topics, and that some of his sentences had been expanded into paragraphs, and some of his paragraphs into chapters. But this want cannot have been felt by the contemporaries of Thucydides, while the fate of other ancient historians warns us that had his work, like theirs, been looser in texture, or less severely perfect, it would not have survived, as it has done, the wearing influence of time, or remained, in its own language, the *ktema es aei* — the "possession for ever" — it has proved to the world.

It has been reserved for the 19th century to impeach the credibility, depreciate the matter, and to condemn the style of Thucydides. As these indictments, however, usually conclude with the statement that Thucydides remains nevertheless the greatest of historians, they might here be passed over in silence were it not in the first place that they serve to show that Thucydides' fame is proof against the solvents of modern criticism, and next that they help us to a more complete understanding of the qualities which have given to Thucydides' work such a wonderful hold over the intellects and imaginations of all his readers and critics. The attacks on Thucydides' credibility have proceeded from Germany, but have met with little acceptance there, and have found only one English-speaking follower, Professor Mahaffy. The most serious outcome of the discussion seems to be that Thucydides' knowledge of the topography of the Platæa was defective, and that his account of the siege is consequently in accordance with the situation rather as he conceived it than as it actually was. But, even if we accept this application of the methods of modern criticism, it must not be imagined that those methods have all the same tendency. On the contrary, the actual treaty which Thucydides quotes in v. 47 has been discovered of late years, and confirms the accuracy and truth of the historian in a most unexpected and startling manner. The exact amount of accuracy or inaccuracy in Thucydides' account of the siege of Platæa is matter of opinion; his accuracy in the matter of the treaty is not — it is beyond dispute. But, after all, it is not by tests such as these, welcome as they are, that we can form an adequate opinion on the credibility of Thucydides.



THUCYDIDES.

As an Athenian comedian remarks, we do not believe a man because he takes an oath — we trust the oath because we believe in the man. And so we believe in Thucydides, not because we have external tests to apply (for we have not enough), but because the universal experience of all who read him is a feeling of conviction that his intention was to speak the truth, so far as he could ascertain it. This conviction is ultimately due to the fact that in the man's work we are brought directly into touch with the man, and we judge his character as we judge that of any acquaintance whom we know in the flesh. No man can devote himself for 27 years to composing a work without putting a good deal of himself into the work, or without writing his character down in it — unconsciously, but none the less legibly. What, then, are the qualities of character which impress the reader of Thucydides? In the first place, his impartiality. This is a quality unknown to Latin historians for instance. Tacitus will not admit that the Romans were ever defeated — the result was, at most, indecisive — even though the subsequent movements of the troops, as described by himself, clearly show that the Romans lost. Thucydides, on the other hand, though an Athenian, never extenuates even the mistakes of the Athenians; and though himself banished by them, sets down naught in malice against them. Next, the reader feels that Thucydides strove — and that always — to ascertain facts, and to put down as facts nothing but facts. This conviction is forced on one in many ways, some of which are palpable enough to admit of being clearly indicated.

To begin with, there is the fact that, when in search of a subject, Thucydides did not like all other historians before him, choose a period of ancient history, which, being ancient, must be based on vague hearsay or dim tradition. He preferred contemporary history and events which he himself witnessed in part, while he could obtain the evidence of eye witnesses for the remainder. Nor did he wait till the conclusion of the war before setting about his task; from the very beginning he began collecting his facts. Next, his history is not designed to prove or illustrate any theory. He himself, in the passage quoted above, disclaims all attempt to adapt facts "to any notion of his own"; and it is evident that beginning to write, as he began, at the commencement of the war, when its course and its issue were yet in the future, he could not have designed to bring its history into conformity with any preconceived or *a priori* theory.

Herodotus, writing the history of the past, was in a position to trace the finger of destiny in what had happened, and to explain history by means of final causes. But Thucydides, when he undertook to record the present, thereby deliberately elected to confine himself to efficient causes. This preference for efficient causes and for "scientific" history, in the best sense of the term, is intimately connected with the "positive" nature of his history — that is to say, with his perpetual endeavor to record facts and to distinguish them from inferences drawn from facts. A clear consciousness of this difference is involved in one of the most characteristic features of his history — that is, the marked difference between his narrative and the speeches which he introduced into it. The former contains facts and facts only, facts stated with a precision and objectivity which — *e. g.*, in his description of the symptoms of fever in sufferers from the great plague — have been the marvel of all subsequent generations, and the greatest marvel to those who by special professional knowledge are competent to judge. The speeches, on the other hand, are not what the speakers actually said — but of this Thucydides warns the reader at the beginning, showing clearly at once the distinction he drew between facts and inference, and his anxiety that the reader should realize the distinction. In fine, most of the untruth in this world is due not to deliberate perversion, but to the simple fact that so many people are quite unconscious what truth is. When, then, we find that Thucydides had a conception of historic truth and fact such as 2,000 subsequent years have been unable to improve, and that he strove strenuously all his life to live up to that conception and write up to it, we can well understand that even 19th-century criticism acknowledges itself incapable of shaking his credibility.

As for the subject of Thucydides' history, if the Peloponnesian war was not a matter of importance in universal history, it was at least not Thucydides' fault that he was not a contemporary with some more important war. But we may beg leave to doubt whether the Peloponnesian war was of inferior interest for the fortunes of mankind. Had it not been for the exhaustion it induced, Greece would not have succumbed to the Macedonian, and consequently Alexander's conquests would never have spread Greek culture over the ancient world. But, apart from this, Thucydides' history is the history of the effects of empire on an imperial State; and, as such, will always be of enthralling interest to citizens of sovereign communities. Finally, Thucydides' style, criticized by Dionysius, and condemned by Mure, is (in the speeches) difficult beyond all possibility of dispute. To throw the blame of this obscurity on the unformed condition of Attic Greek at the time when Thucydides wrote is warrantable indeed, but is no adequate defense. To point, on the other hand, to the tract "On the Athenian Polity" as proof that Attic prose could be translucent in Thucydides' time is beside the point, for Attic, as is well known, could only be written well by those who lived continuously in Athens, and Thucydides was exiled for many a year. But, in truth, the question whether it is Thucydides or the literary age in which he lived that is to be blamed for his obscurity is a wholly irrelevant question. Obscurity, whatever be its cause, is a crime in a writer. But it is a crime which carries its own punishment, for it diminishes the number of an author's readers. The exact amount of criminality is not to be determined on any abstract principles or by the exercise of any mysterious "taste"; it admits of one simple practical test — viz., has the obscurity of his style (in so far as it exists), as a matter of fact, prevented him from attaining fame? In the case of Thucydides it has had no such effect, as all testify. People will not read a difficult author if there is an easier one out of whom they can get as much. That Thucydides has, in spite of his difficulty, always been read is in itself sufficient testimony that there is no other historian to rank with him.

Thug, or **Thag,** the name given in the N. provinces of India to a member of a fraternity, who looked on murder as the sole means of staying the wrath of the goddess Kali, and derived their principal means of support from the plunder of their victims. In old times, according to Hindu mythology, Kali made war on a race of giants, from every drop of whose blood sprang a demon. These demons multiplied, and at last the goddess created two men to whom she gave handkerchiefs, with which they strangled the infernal beings. When the men had finished their task the goddess gave them the privilege of using the handkerchief against their fellows, and so the class of Thugs is said to have arisen. Though worshiping a Hindu goddess, the majority of the Thugs were Mohammedans. They usually traveled in gangs, the members of which had ostensibly some honest calling in their own community, and in selecting their victims always endeavored to pitch on persons of property in order that while propitiating the goddess they might enrich her worshipers. Various steps were taken to suppress the Thugs, both by the native and the English governments, and in 1829 Lord William Bentinck adopted such stringent measures that in six years (1830–1835) 2,000 of them were arrested; and of these 1,500 were convicted and sentenced to

death, transportation, or imprisonment, according to the gravity of the charges proved against them. In 1836 a law was passed making the fact of belonging to a gang of Thugs punishable by imprisonment for life with hard labor, and though some gangs linger in districts where British authority or the power of the more enlightened native princes cannot reach, the system is now so broken that it is practically powerless.

Thuja. See ARBOR VITÆ.

Thuja Oil, obtained by distilling the ends of the branches and leaves of *Thuja occidentalis* with water. It is a mixture of several essential oils boiling between 190° and 206°. It is colorless when fresh, has the odor of thuja, is lighter than water, slightly soluble therein, but easily soluble in alcohol and ether. By oil of vitrol it is immediately resinized.

Thujenin, $C_{28}H_{24}O_{14}$; thujigenin; obtained by heating for a short time a mixture of thujetin and hydrochloric acid. It forms microscopic needles slightly soluble in water, but soluble in alcohol.

Thujetic Acid, $C_{28}H_{22}O_{13}$; prepared by boiling thujetin with baryta water, adding sulphuric acid after a while, then alcohol, and filtering the liquid when hot. It separates in lemon-yellow microscopic needles, soluble in alcohol and precipitated by water.

Thujetin, $C_{28}H_{28}O_{16}$; a tannin substance obtained along with a crystallizable sugar by heating thujin with dilute acids. The liquid after a time becomes colorless, and deposits thujetin on evaporation. It is soluble in alcohol and ether, and insoluble in water. Its alcoholic solution assumes a splendid blue-green color with ammonia, and is turned inky-black with ferric chloride.

Thujin, $C_{20}H_{22}O_{12}$; a crystallizable glucoside occurring in the green parts of *Thuja occidentalis*. It forms lemon-yellow microscopic crystals, has an astringent taste, is soluble in alcohol, gives a yellow precipitate with acetate of lead, and is colored dark green with ferric chloride.

Thujone, or **Thujene,** a volatile hydrocarbon obtained from thuja oil by distilling it over iodine, quicklime, and potassium, in succession. Thujone is like turpentine oil in taste and odor, is lighter than water, and boils at 165–175°.

Thule. See ULTIMA THULE.

Thulite, in mineralogy, a rose-red variety of Zoisite, with sp. gr. 3.124, strongly dichroic parallel to the vertical axis. The original was found at Souland, Tellemarken, Norway.

Thulstrup, Thure de, an American artist; born in Sweden, in 1848; was graduated in the Royal Artillery School in 1865; commissioned lieutenant in the foreign legion which made the expedition to Algiers; 1st lieutenant and captain in the Franco-Prussian War; took part in the campaigns of the Loire and the East; participated in both battles of Orleans; and engaged in the street fights with the Communists in Paris. He came to the United States in 1872; began his artistic career on the New York "Graphic" in 1873; was connected with Frank Leslie publishing house in 1876–1880, and in the latter year went to the Harpers. He became widely known as a book and magazine illustrator, especially on military and historical subjects.

Thumb Flint, in anthropology, a popular name for a short form of scrapers, the longer varieties of which are sometimes known as "finger flints." Evans thinks that these names, "though colloquially convenient, are not sufficiently definite to be worthy of being retained."

Thumb-screw, a former instrument of torture for compressing the thumbs. It was employed in various countries, Scotland in particular; called also thumbikins or thumbkins.

Thun, Lake of, a body of water 11 miles long and 2 miles wide, in the canton of Berne, Switzerland. It lies about 1,800 feet above sea-level, in a beautiful region annually visited by great numbers of tourists. On its E. shore is the town of Interlaken, and on its W. Thun, the latter being the starting point of tourists to the Bernese Oberland. There are steamers on the lake and the two towns are joined by a railroad.

Thunbergia (named after Carl Petter Thunberg (1743–1828), a Swedish traveler, botanist, and Professor of Natural History at Upsal, in botany a genus of *Gardenidæ*, sometimes made a synonym of *Gardenia*. Involucre two-leaved; calyx about 12-toothed; corolla campanulate; capsule beaked, two-celled. Handsome and fragrant climbers, cultivated in gardens for the beauty of their flowers. *T. fragrans* has cordate, acuminate leaves; *T. grandiflora* angular, cordate leaves, larger flowers with no inner calyx, and the anthers bearded and spurred. Both are natives of the East Indies.

Thunder, the violent report which follows a flash of lightning. It commences the same moment as the flash; but, as the sound travels only at the rate of about 1,100 feet a second, while light does so at the rate of 190,000 miles, the flash of the lightning is the first to be perceived, and thus a means is afforded of calculating the distance of the lightning. The noise of the thunder arises from the disturbance produced in the air by the electric discharge, but why the sound should be so prolonged

has been differently explained. The old hypothesis was that the sound was echoed from every precipice, from every building, and from every cloud in the sky. Another is that the lightning itself is a series of discharges, each producing a particular sound according to the distance at which it commences, and the varying densities of the portions of air which it traverses before reaching the ear. A third conjecture is that the noise arises from the zigzag movement of the electric fluid, the air at each salient angle being at its maximum compression.

Thunder Bird, an imaginary bird occurring in the mythology of races of low culture, and personifying thunder or its cause. Among the Caribs, Brazilians, Harvey Islanders, and Karens, Bechuanas, and Basutos, there are legends of a flapping or flashing thunder bird, which seem to translate into myth the thought of thunder and lightning descending from the upper regions of the air, the home of the eagle and the vulture.

Thunderbolt, in heraldry, the thunderbolt is represented as a twisted bar in pale, inflamed at each end, surmounting two jagged darts in saltire, between two wings expanded, with streams of fire issuing from the center.

THUNDERBOLT.

Thunder Fish, a species of fish of the family *Siluridæ,* found in the Nile, which, like the torpedo, can give an electric shock. It is the *Malapterurus electricus* of the naturalists.

Thundering Legion, a Roman legion containing some Christians, which (A. D. 174) fought under Marcus Antoninus against the Marcomanni. The Roman army was shut up in a defile and ready to perish with thirst, when a thunderstorm with heavy rain relieved them of their distress, and so terrified the enemy that a complete victory was gained. The Christians attributed the deliverance to the prayer which they had just before presented, and considered it miraculous. The heathen also considered the interposition supernatural, but ascribed it to Jupiter, Mercury, or to the power of magic. Also a legion composed of Christian soldiers raised in the Thebaïs, and led by St. Maurice. The name existed long before it was applied to either of these two legions.

Thurgau, a canton N. E. of Switzerland; bounded mainly by the Lake of Constance and the cantons of Zürich and St. Gall; area, 381 square miles; capital, Frauenfeld. It differs much in physical conformation from most other Swiss cantons, in having no high mountains, though the surface is sufficiently diversified. The whole canton belongs to the basin of the Rhine, to which its waters are conveyed chiefly by the Thur and its affluents, and partly also by the Lake of Constance, including the Untersee. The principal crops are grain and potatoes; large quantities of fruit are also grown. In many places the vine is successfully cultivated. The manufactures consist chiefly of cottons, hosiery, ribbons, lace, etc. Pop. (1908) 118,620.

Thurible, in ecclesiastical usage, a censer, a vessel for burning incense. Thuribles of some kind must be as old as use of incense in the services of the Church; but their present form, according to Martigny, dates only from the 12th century. The modern thurible consists of a metallic vessel or cup, sometimes of gold or silver, but more commonly of brass or lateen, in which burning charcoal is placed, with a movable perforated cover. Chains are attached, so that the thurible may be waved to and fro for the readier dispersion of the smoke of the incense, which is thrown on the live charcoal.

Thurifer, in ecclesiastical usage, the attendant at high mass, solemn vespers, and benediction, who uses the thurible, either by simply waving it to and fro or for incensing the clergy, choir, and congregation, and at certain times presents it to the officiating priest that he may incense the altar or the Host. Strictly speaking, the office of thurifer belongs to the acolyte, the highest of the four Minor Orders, but all the functions of the acolyte are now freely performed by laymen.

Thüringerwald (tü′rĭng-er-valt), or **Forest of Thuringia,** a mountain chain in the center of Germany, stretching S. E. to N. W. for about 60 miles. Its culminating points are the Beerberg and the Schneekopf, which have each a height of about 3,220 feet. The mountains are well covered with wood, chiefly pine. The minerals include iron, copper, lead, nickel, cobalt, etc.

Thuringia (German, Thüringen), the name still borne by that part of the ancient Saxon area which is generally bounded by the Werra, the Saale, and the Harz Mountains; the Thuringian States being the minor Saxon duchies, the two Schwarzburgs, the two Reuss principalities, and small parts of Prussia, Saxony, and Bavaria. The district got its name from the Thuringian tribe of Germans, who were found inhabiting it in the 5th century. The Thuringian Forest is a series of wooded mountain ridges occupying a great part of this area. It is about 70 miles long, and belongs to the Sudetic system.

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